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PIPE LINE INDUSTRY

APRIL
1959

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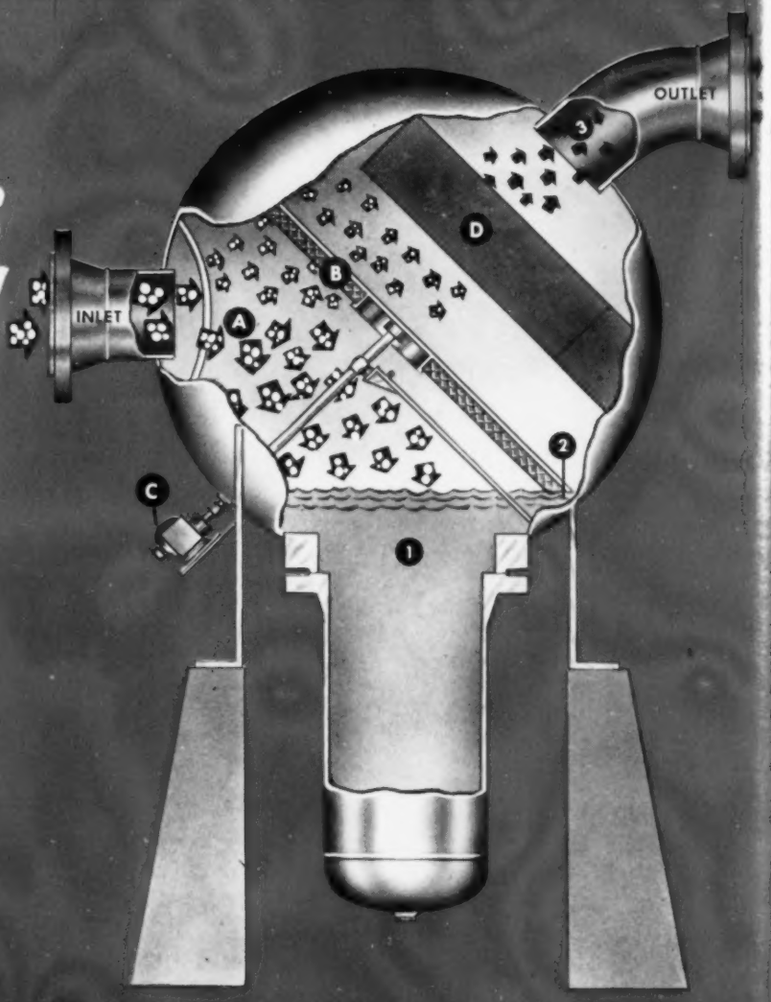

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APR 14 1959

PIPE LINE INDUSTRY

April, 1959 Vol. 10, No. 4

CONTENTS and Quick Look

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

IDEAS FOR THE FUTURE

Have you been keeping up with Pipe Line Pete's "ideas for the future"? They're creating quite a bit of comment among our readers. In this issue you'll find information about . . .

. . . a super stickum that may be used to mend everything from bolts to bones . . .

. . . scientists are taking a long look at the ocean floor as a rich source of minerals. For these and other ideas for the future, turn to Page 61.

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PIPE LINE INDUSTRY Published every month. Second class postage paid at Houston, Texas.

SP Completes Year's Run in High Sierras

☐ Southern Pacific Pipe Lines' new San Francisco-to-Reno products system crosses some rugged terrain. Designers and operators planned ahead to take care of these difficulties. Valve operating platforms were mounted on poles and special drainage ditches and grading have prevented damage from landslides. It all adds up to a year of almost trouble-free operation.

By W. T. Eskew, Jr. . . . . Page 36

Electrical Survey Detects Underground Rock

☐ From the field of highway construction comes a new idea that may take part of the guesswork out of bidding. The instruments are inexpensive—cost is about $700—and they can be used to determine the type of soil at any practical depth.

By Howard E. Barnes . . . . . Page 43

Gas-Fired Turbine Is Working Out

☐ The first gas-fired turbine to make an appearance on a products line was installed by Great Lakes Pipe Line Company on its Tulsa-Barnsdall line. The 1,150-hp machine uses natural gas fuel and the pump it drives can handle as much as 4,200 barrels of products per hour. Look for more such installations. . . . . Page 45

How Russians Saved 290,000 Rubles on River Crossing

☐ The job was to lay a line across the Yenisei River at Krasnoyarsk in Siberia. The Russians had plenty of ice and they made the most of it.

By A. J. Steiger . . . . . Page 48

How to Design Impressed Current Systems—Part 2

☐ Here are more useful engineering tools to help you design efficient cathodic protection systems. Attenuation curves tell where protection current will be going on the line and show effects of coating quality and terminal conditions on current distribution. Ideal conditions—a uniform line of infinite length and a remote source of current—seldom, if ever, exist. But practical systems can still be designed using these equations.

By James C. Bell . . . . . Page 52

Marine Methods Used to Lay Shell's Delta Line

☐ Houston Contracting Company and Glaser Construction Company, Inc., used "push-pull" and "canal" techniques on Shell's 118-mile Delta crude line. Specially designed concrete piling foundations support pump stations installed in lower Delta area.

By Donald G. DePugh . . . . . Page 56

Work Simplification at Work

☐ Service Pipe Line Company hired a consultant to supervise its work simplification program, then everyone got into the act. The result: 90 improvements in methods and a saving of 25,000 man-hours the first year. Basis of the program: organized common sense. . . . . Page 63

Will Communism's Economic Offensive Hit Pipe Lines?

At the moment the Free World's attention is drawn to Berlin and the proposed Summit meeting, but there is still good reason to keep a sharp eye on Russia's global industry sales drive. News events of recent weeks reveal more moves toward oil and gas markets. It could even reach into the pipe line industry.

Associated Press reports from Stockholm revealed that a Finnish trade delegation returned to Helsinki from a Moscow junket with Soviet offers of crude oil deliveries "at a very favorable price." Crude would be delivered to north European customers from Baltic ports through a pipe line network stretching as far south as Baku on the Caspian and to the Black Sea. Soviet oil sold in northern Europe in the past had to come all the way around the continent by the Mediterranean-Atlantic-Baltic route.

Similar promises of future natural gas deliveries to Sweden through "plastic pipe lines" under the Baltic were also made to a Swedish trade delegation in Moscow. Deliveries of the Ukranian natural gas would begin "in a few years."

These economic thrusts may be far away, but the importing of a tanker load of Rumanian oil to the United States and the recently disclosed Russian "deal" proposing to sell crude to Canada bring them closer home.

Under the proposition made to Canada, Russia was to supply 300,000 barrels of crude daily to the Canadian government on the East Coast at a price 50 cents a barrel lower than presently imported Middle East or Venezuelan crude. Russia's proposal suggested that the government sell this at the regular market price and use the net gain to subsidize the Canadian industry.

On the other side of the coin, Russia would agree to take an equivalent amount of western Canadian crude from Pacific ports for shipment to eastern Siberia.

Such an arrangement would establish close economic ties between Canada and the Communists. It would make East Coast refineries dependent to a large degree on Iron Curtain crude oil sources; while at the same time making western Canadian producers dependent on Russia as a major buyer.

Subsidized Canadian crude production would enter U.S. and other Free World markets with a significant price advantage. The result of such an agreement would also strike a serious blow to the Canadian pipe line industry. Proposals for expansion or construction of any new inter-provincial systems would be all but dead.

The Russian proposal was rejected by Canada. But there is no way of guessing where the next economic probe may be made by the Communists—or of its effect on the oil and pipe line industry.

There is one bright side of the Russian economic offensive. If it is only a propaganda effort it may backfire. For years, U.S. pipeliners have dreamed of laying lines from the Middle East to Europe. Apparently the economics are feasible; the main obstacle has been cooperative agreement between nations along the right-of-way. With Nasser's Arab bloc cooling toward the Communists' courtship, agreements might soon become more likely.

Two large engineering firms have been making feasibility studies for the Middle East-Europe line. Another study is underway for a gas line from North African fields to Spain and France by way of Gibraltar.

Such projects meeting the Red energy-economic challenges head-on could well strengthen the Free World—while ignoring these Communist thrusts will only bring more.

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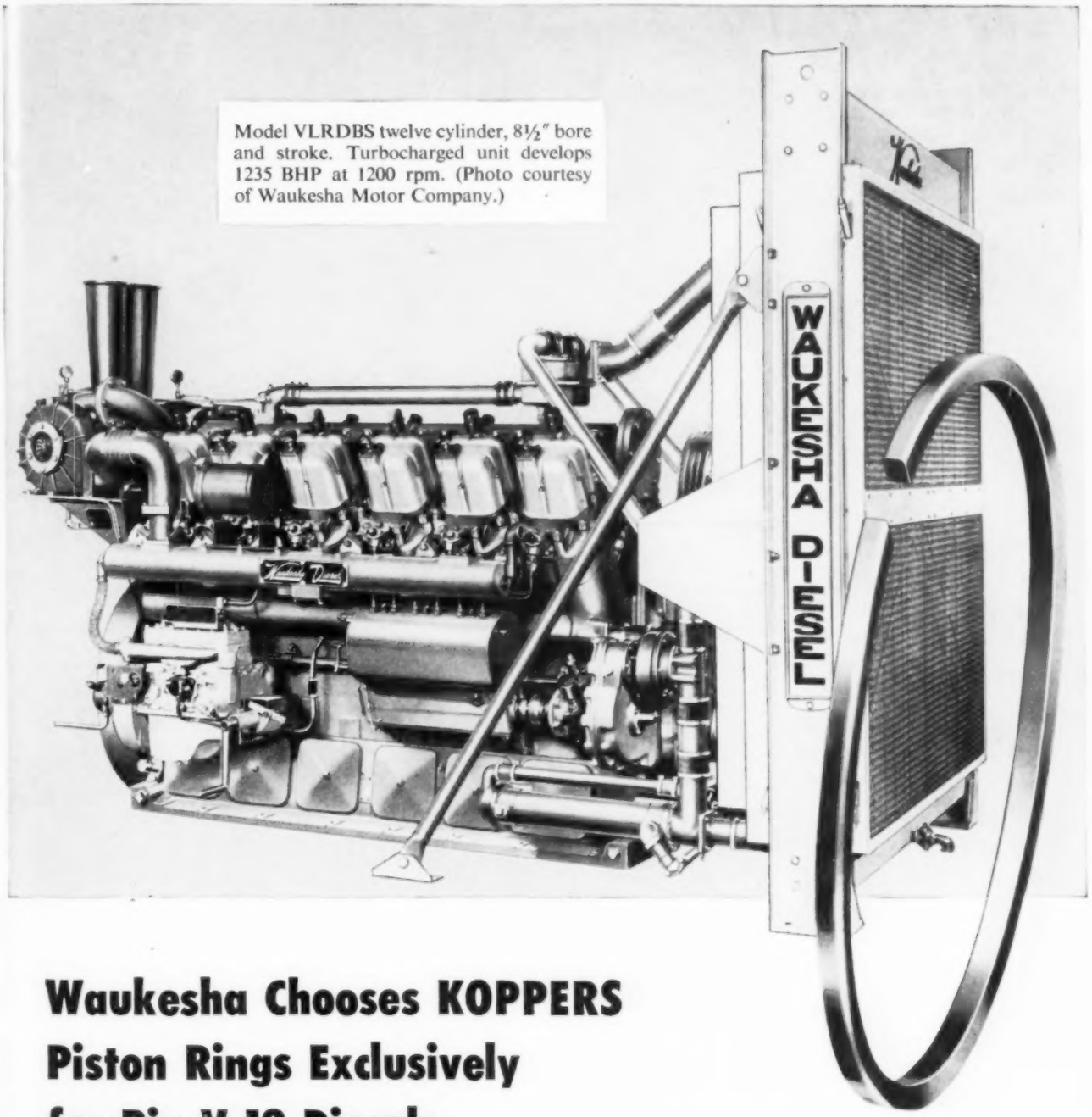
Indexed by Engineering Index



Model VLRDBS twelve cylinder, 8½" bore and stroke. Turbocharged unit develops 1235 BHP at 1200 rpm. (Photo courtesy of Waukesha Motor Company.)

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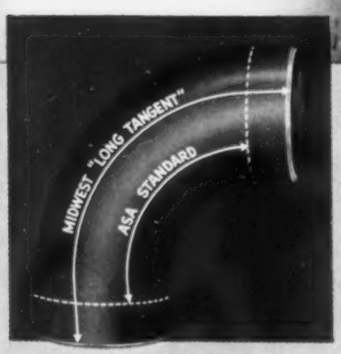

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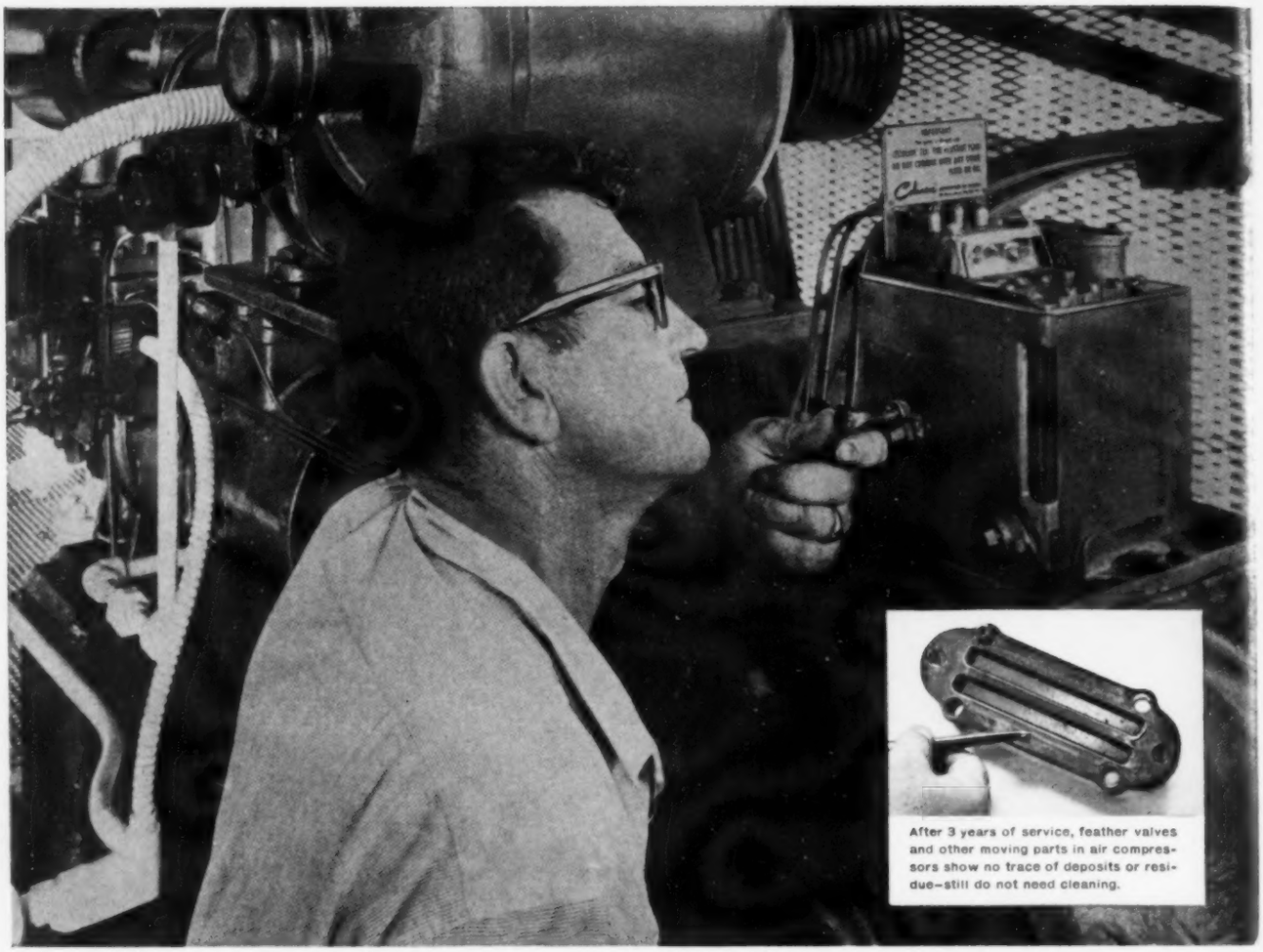

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"Cellulubes eliminate fires and explosions ... keep compressor parts clean"

says MR. T. E. DANIEL, Foreman, Cypress Compressor Station
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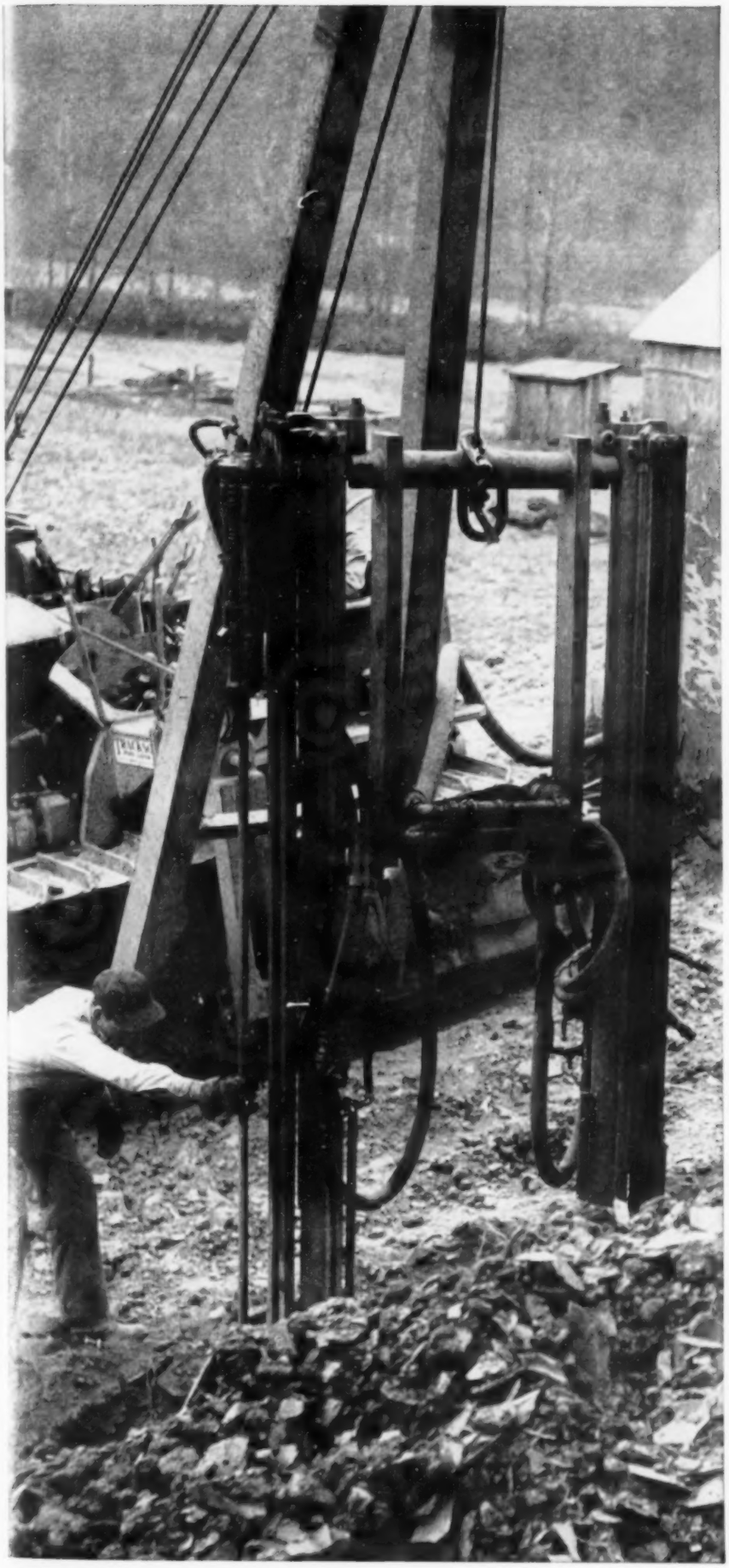

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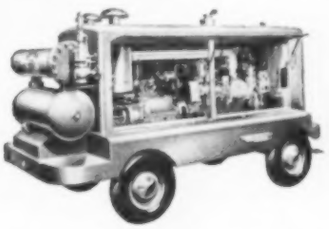

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For more data on advertised products, use Readers' Service Cards, last page.

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How to Play It Safe When Loading Slings and Hoist Lines

1. **Keep pull** on sling legs in a straight line. Never shorten legs with knots or I-bolts. If choker and basket hitches are used on slings, check rated load limits.

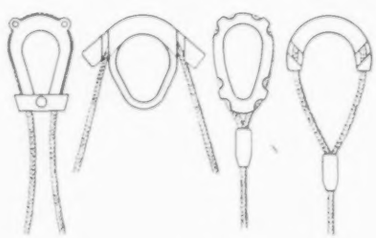
2. **Load slings** on the center of hooks. Never at their points, except for hooks specially designed for point loading.

3. **Never use** load hooks that are bent open. They have been overloaded, and may drop loads with disastrous results. Same goes for defective chain blocks. Insist that your men report them at once.

4. **Lubricate wire ropes** at regular recommended intervals, with lubricant recommended by your local oil company engineer.

Proper Fittings Can Give Slings Added Safety and Service Life

The sling eye is usually the point of greatest wear in load handling. The proper sling fitting acts as a shield to take the brunt of this wear—the load shocks, abrasion and other stresses concentrated in the eye. Shown here are some of the Tuffy fittings you can have factory-installed in your Tuffy Slings, or they can be installed in your own rigging loft. Left to right: (1) **Equalizing Thimble** permits adjustment of the length of sling legs so that loads of varying dimensions may be picked up and handled on an even keel. (2) **Newco Sling Bridle** will not slip when handling unbalanced loads. (3) **Newco Slip-Thru Thimble** allows passage of an identical thimble through its eye—necessary when a regular sling is used as a choker sling. (4) **Newco Slip-On Thimble** eliminates flattening or pulling together of eyes under heavy loads; can be attached or removed in seconds.



Tuffy Sling Stamina is Matched in Tuffy Hoist Line

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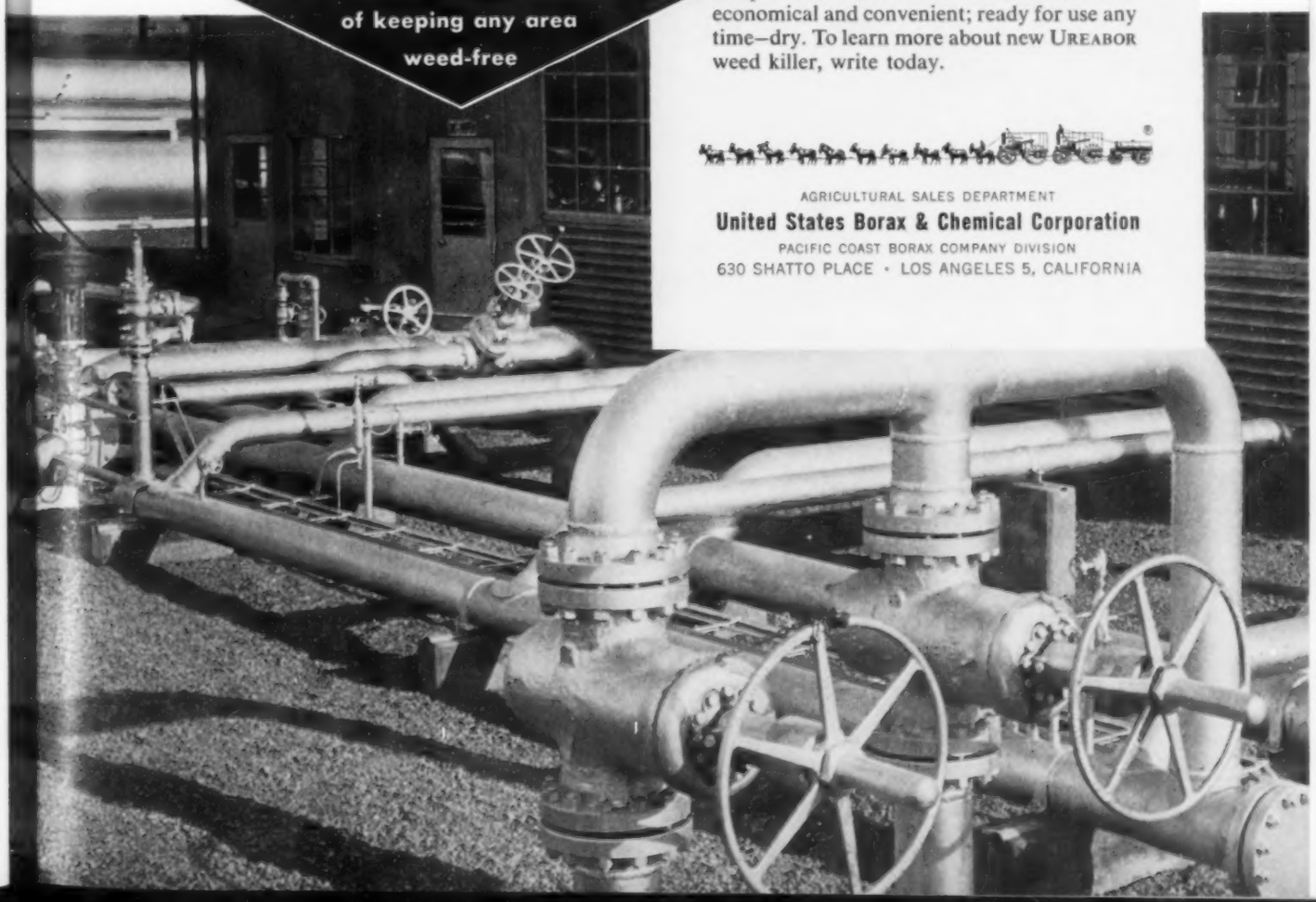

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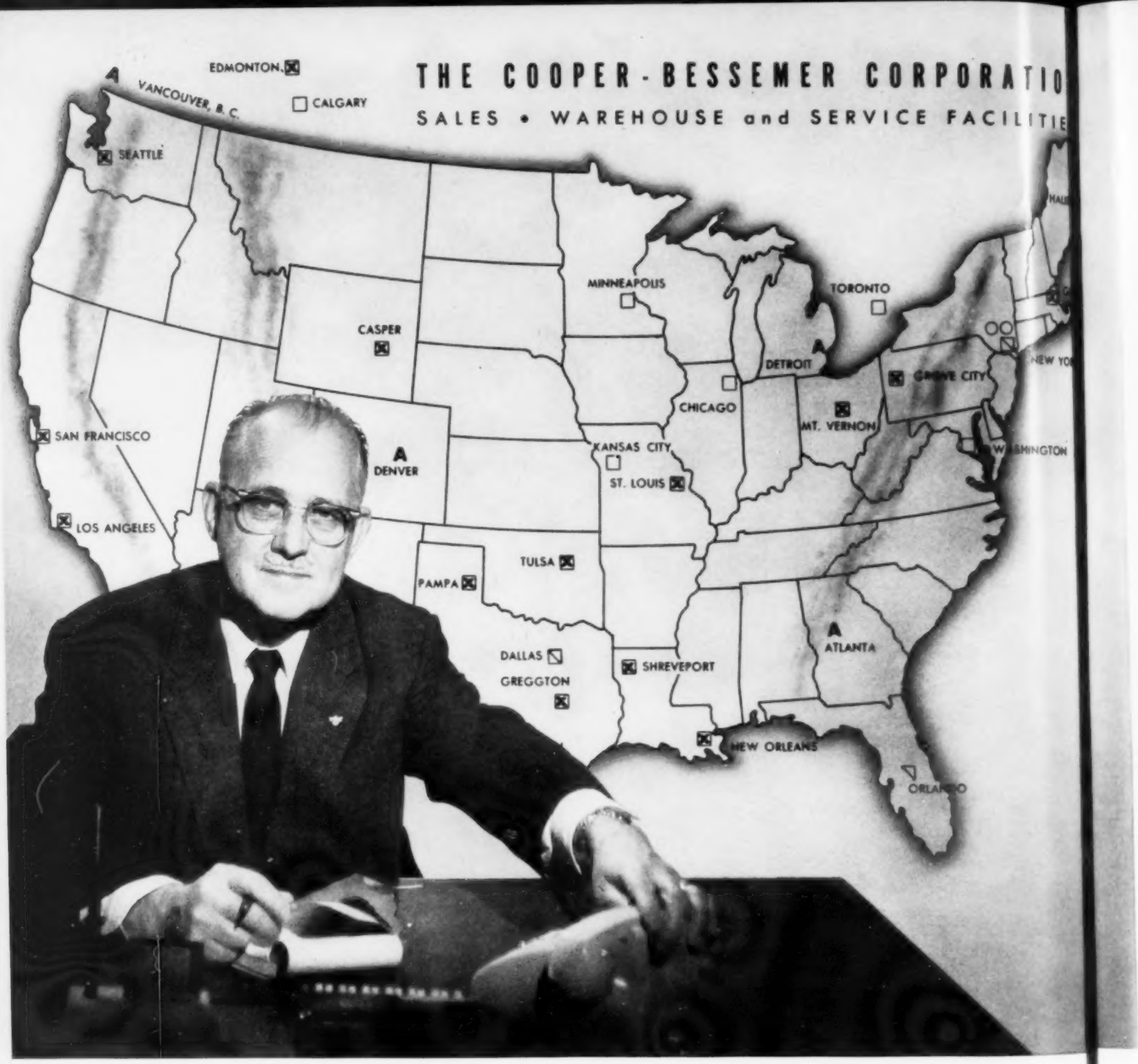
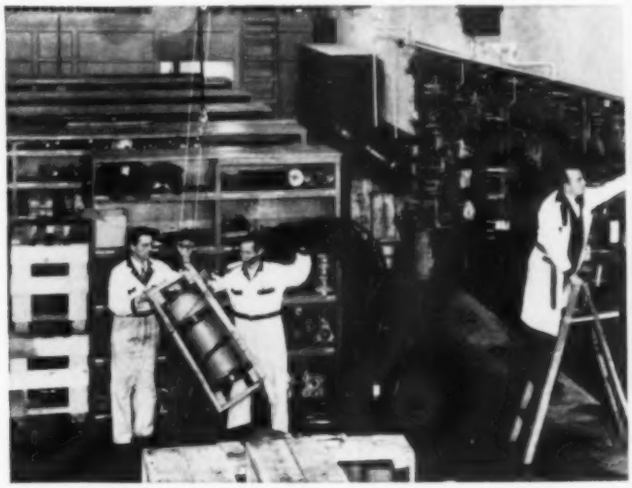


Edmund S. Budd, *Manager of Parts Division, The Cooper-Bessemer Corporation, points out that...*

You are this near to Cooper-Bessemer service!

Cooper-Bessemer engineers are ready to assist you in planning power or compression facilities, or solving operating problems.

Experienced Cooper-Bessemer field technicians assist you in installation and servicing of equipment.



Cooper-Bessemer warehouses, strategically located, provide replacement parts for speedy servicing and peak availability of your facilities.

WHEN YOU INVEST in Cooper-Bessemer engines, compressors or controls, our service facilities are as close to you as the telephone . . . night and day! We serve you in these three important ways:

Technician service. Our skilled installation and maintenance crews are permanently located in areas throughout the country, ready to assist you, to assure top economy of operation and availability of your Cooper-Bessemer equipment.

Warehouse service. We maintain an extensive inventory of replacement parts for Cooper-Bessemer products in strategic locations to give prompt attention to your needs.

Engineering service. As new or changed conditions arise, our experienced field service engineers can give you on-the-spot recommendations. And they are backed up by the strong team of Cooper-Bessemer engine and compressor engineers in Mount Vernon.

The superiority of Cooper-Bessemer Service can save you thousands of dollars yearly in capital investment and in operating cost. Make sure you take this important *plus value* into account when you specify and buy engine and compressor facilities.

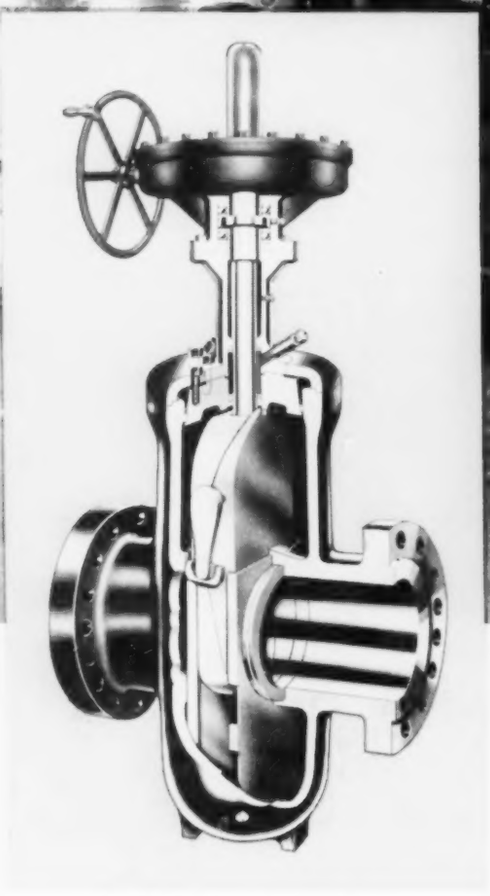
BRANCH OFFICES: Grove City • New York • Washington Gloucester • Chicago • Minneapolis • St. Louis • Kansas City • Tulsa New Orleans • Shreveport • Houston • Greggton • Dallas • Odessa Pampa • Casper • Seattle • San Francisco • Los Angeles

SUBSIDIARIES: Cooper-Bessemer of Canada, Ltd. . . . Edmonton Calgary • Toronto • Halifax
C-B Southern, Inc. . . . Houston
Cooper-Bessemer International Corporation . . . New York • Caracas Mexico City

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN



Leverlock* Gate Valves — A W-K-M Exclusive

W-K-M Pipeline Valves open **free** and close **easy** against any pressure within their rating. An exclusive centralizing mechanism—found only in W-K-M Leverlock Valves—positively holds the gate and segment assembly in a retracted position so that it will move freely between the seats when the valve is being opened or closed.

When the gate and segment reach the fully open or fully closed position—and only then—the centralizing mechanism releases to permit the gate and segment to expand and seat tightly against the upstream and downstream seats.

On Hand

Order 2-inch through 12-inch sizes from your supply store. Larger sizes to 34-inch available on special order from factory. Sizes 6-inch and larger are Leverlock Valves. ASA 300 pounds to ASA 1500 pounds.

*Trademark of ACF Industries, Inc.

The W-K-M®
Through-Conduit Gate Valve is your valve

W-K-M's creative engineering designed this valve to solve *your* pipeline valve problems. It has been produced to meet your specifications for strength, long life and economy. Before it reaches you, it will have undergone rigorous and thorough testing.

That's why field men recommend the W-K-M Through-Conduit Gate Valve, why engineers specify its use. Its reputation inspires confidence—its dependability has been proved in service throughout the world.

It's *your* valve; specify and use it.

A Product of W-K-M's *Creative Engineering*

WRITE FOR CATALOG 300

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS
Export Office: 45 ROCKEFELLER PLAZA, NEW YORK, N. Y.

5818

Here's how you can slash Pipeline Operating Costs with a Digital Telemetering System

Compare these facts on communication line costs of a digital telemetering system with those of typical analog telemetering systems and you realize that first-cost becomes an item of minor importance.

FACT 1 Analog systems require additional transmission lines when there are more than 15-20 information points.

FACT 2 A digital system can handle a virtually unlimited number of information points with a single telegraph-grade line.

FACT 3 Continuous analog signals tie up entire lines while digital systems give regular hourly reports (plus automatic alarm signals at any time) on a standard Teleprinter machine. This permits use of line for ordinary Teleprinter communication during all but a few minutes of every hour . . . an extremely worthwhile extra economy.

FACT 4 A digital system utilizing Norwood Controls ElectroSyn servos and Series 2100 encoders, requires only telegraph-grade lines. The output of the ElectroSyn encoder is 3-digit Teleprinter code which can be transmitted without costly conversion equipment.

Typical 25 Year SAVING

$1,179,000

And we have the figures to prove it . . . thorough analyses of typical analog vs. digital communication costs. We would welcome the opportunity to discuss them with you.

ADDITIONAL PROFITS are to be gained from increased throughput due to greater reporting accuracy of a digital system which results in lower safety margin requirements.

AND . . . because digital system reliability keeps maintenance costs extremely low, this tremendous annual saving becomes almost pure profit as soon as first-cost has been recovered.

NORWOOD CONTROLS

For full explanation of advantages of digital telemetering systems utilizing ElectroSyn equipment, write for ElectroSyn Bulletin B258 — Norwood Controls Unit, Detroit Controls Division, 931-A Washington Street, Norwood, Mass.

American-Standard PRODUCTS

AMERICAN-Standard

DETROIT CONTROLS DIVISION

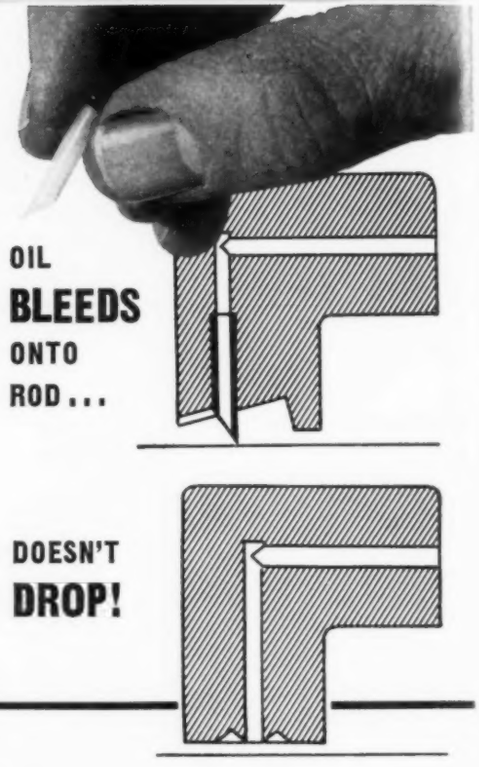
ENGINEERING

NEWS YOU CAN USE ABOUT ENGINE AND COMPRESSOR PERFORMANCE

EXCLUSIVE NEW COOK QUILL* ASSURES BETTER LUBRICATION OF HIGH-PRESSURE PACKINGS

Oil "dripping" has caused a lot of trouble in high-pressure packings. The surface tension of the heavier oils tended to foul the nozzle, bleeding the lubricant down inside the cup bore instead of on the rod. Result: intermittent feeding or none at all. A new Cook-engineered drip nozzle design has solved this problem. Key to the new design is a Teflon quill that extends beyond the cup inner bore and actually *touches* the rod. Even after long wear, the quill will be within a few thousandths-of-an-inch of touching the rod. Thus, oil gradually bleeds onto rod . . . doesn't drop. This means that it will maintain a satisfactory oil film on the rod at all times. The exclusive quill is now standard on all Cook steel packings from 4,000 PSI upward. Ask a C. Lee Cook representative to give you the details.

**Patent Pending*



"IMPROVE YOUR PISTON RING PERFORMANCE"

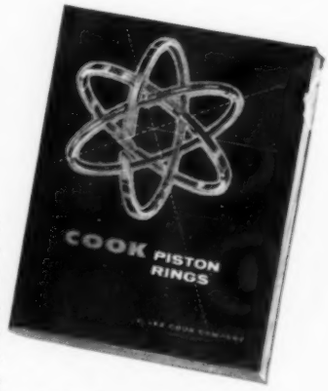
SEND FOR FREE 8-PAGE BOOKLET

Write for your free copy of this technical article. Gives valuable data on improving your engine's performance and keeping it high for longer periods by better cylinder sealing. Offers practical advice on (1) how to tell whether rings should be reused or replaced, (2) choosing a ring setup, (3) relieving top ring load, and other problems. In short, it's a brief, handy guide to better piston ring performance. For your copy, write C. Lee Cook Company, 944 So. 8th St., Louisville 3, Ky.

SEE OUR EXHIBIT

BOOTHS 51 and 52 TEXAS BLDG.

WRITE FOR COOK'S NEW PISTON RING CATALOG



Sixteen-page catalog just off the press. Describes complete line of piston rings manufactured by C. Lee Cook Company, also the special rings of the Airtomics Division. For your free copy, write: C. Lee Cook Company, 944 South 8th Street, Louisville 3, Kentucky.

C. LEE COOK COMPANY

Division of Dover Corporation

Rings and Packings Since 1888

Available at Pipe Line Service — Harvey, La.

Complete facilities for applying

ANCHORCRETE

Concrete Coatings

When your pipelines require anchoring to offset buoyancy, remember that Pipe Line Service's Harvey plant is completely equipped to apply dependable "Anchorcrete" reinforced concrete coating over high-quality PLS coating and wrapping specifications.

From unloading the bare pipe to loading of the finished product, all operations are under one supervision . . . *one* responsibility. Uniform quality of Anchorcrete is assured through use of prime materials, careful batching, controlled mixing and thorough curing.

Harvey's ample storage facilities enable you to take delivery of your Anchorcreted pipe when you need it. More than 600 feet of dock space, with traveling crane, provide speedy loading directly onto your barge. This eliminates extra handling; assures delivery of protected pipe in perfect condition.

PLS-Harvey is another example of complete service that is designed to give your steel pipe the finest possible protection at lowest possible cost.

General Offices and Plant:
Franklin Park, Ill.

Monmouth Junction, N. J.
Glenwillard, Pa.
Sparrows Point, Md.
Longview, Tex.
Corpus Christi, Tex.
Provo, Utah
Harvey, La.

PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK - ILL.

Pipe Line Service Corporation

HARVEY, LOUISIANA

A Subsidiary Of American Steel Foundries

Quality pioneers in coating and wrapping pipe for over a quarter century

For more data on advertised products, use Readers' Service Cards, last page.

Mr. M. B. Riordan, Vice President
B. J. Service, Inc., Long Beach, Calif., says.

"Low curb weight, price and maintenance costs deciding factors in our preference for Ford t

"We've owned Ford Trucks for almost eleven years and find Ford's low curb weight means bigger loads for us. Our Ford T-800's haul up to 1800 lb. more payload than other trucks of comparable size.

"We've been in the oil well business for 31 years supplying the materials, personnel and equipment to do a complete oil well servicing job. We operate 365 days a year and 24 hours a day. With $25,000-$30,000 tied up in each rig, we could lose money fast if our trucks weren't reliable. We feel our Fords do an outstanding job.

"You can't beat Ford in value, either! Not only is Ford's initial price low but we get three years of hard, rough use out of our Ford Trucks before we trade. That way we keep our costs 'way down.

"Maintenance costs are very reasonable, too. Not only are Ford Trucks easier to overhaul but parts costs are lower—our profit and loss statement proved that to us! And we can get Ford parts anywhere we operate. That's important in our kind of work because it's essential we stay on the job once we are started."

osts have been

ord trucks"

Go FORD-WARD for savings

FORD TRUCKS COST LESS

LESS TO OWN... LESS TO RUN... LAST LONGER, TOO!

NOW!
CERTIFIED PROOF
FORD TRUCKS
COST LESS

All tests conducted and results
CERTIFIED
by America's foremost independent automotive research organization*
*NAME AVAILABLE ON REQUEST
Send inquiry to: P.O. Box 2687 Ford Division, Ford Motor Co. Detroit 31, Michigan

'59 Ford Pickups Win Economy Showdown U.S.A.

—average 25.2% better gas mileage!

Impartial tests of the 1959 pickup models of all six makes prove conclusively that Ford's ½-ton pickups equipped with Short Stroke Sixes are the economy champs for '59.

HOW TESTS WERE MADE

Standard six-cylinder models of the six leading half-ton pickups first were put through exhaustive road trials. All '59 trucks—Ford and competitive—were bought from dealers, just as you would buy them. After at least 600 miles break-in, all were brought up to manufacturer's recommended specifications.

The trucks were then tested—by America's leading independent automotive testing firm—at constant speeds of 30, 45 and 60 miles an hour. Next came stop-and-go tests, ranging from moderate city traffic to normal retail delivery operation. Acceleration rates were carefully timed in each gear to insure accurate results for all makes.

HOW NEW '59 SIXES RATE IN GAS MILEAGE						
'59 FORD SIXES GIVE	25.2% more miles per gallon than Make "C"	31.1% more miles per gallon than Make "I"	9.6% more miles per gallon than Make "G"	42.6% more miles per gallon than Make "D"	22.0% more miles per gallon than Make "S"	25.2% more miles per gallon than the average of all makes

The '59 Ford Sixes, *in every test*, averaged more miles per gallon than every other make! Combining all tests, the '59 Fords led the average of all other '59 pickups by 25.2%.

WHAT'S THE SECRET?

How can a '59 Ford Six make four gallons do the work of five in other trucks?

First, of all pickup Sixes, only Ford has modern Short Stroke design. This new type of engine is basically far more efficient than long-stroke Sixes of other pickups. Example: Ford's Six delivers more usable horsepower than any other pickup Six.

Second, to this modern engine Ford has added a new economy carburetor. By metering fuel more precisely in both low- and high-speed ranges, Ford's new carburetor boosts gasoline mileage in every type of driving. And Ford's *Economy Carburetor* is *standard at no extra cost.*

Your Ford Dealer now has the complete report of Economy Showdown U.S.A. Why not call or visit him today and get the whole story firsthand?

C. E. Williams, Gulf Sales Engineer, Midland, Texas, and G. W. Ramsey, Assistant Plant Superintendent, inspect force feed lubricators on one of the modern gas engines at the Goldsmith plant of El Paso Natural Gas Company.

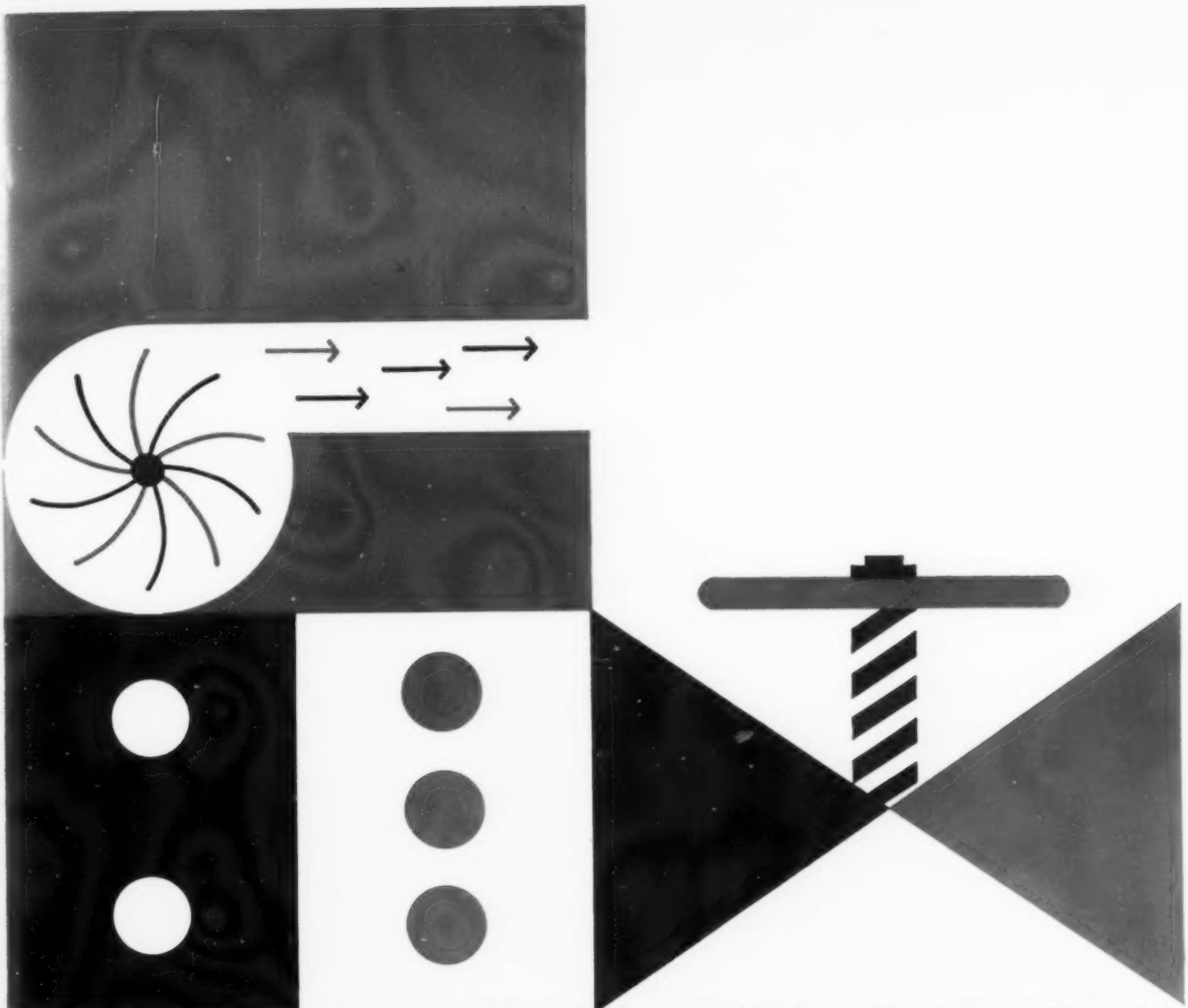
No lubrication problems in 9 years of operation

Since 1949, twenty-seven gas engine-compressor units developing 39,985 horsepower at the Goldsmith plant of El Paso Natural Gas Company have been thriving on Gulf Security Oil. Bearing, ring and cylinder wear maintenance records have been excellent.

Insure safe, more effective lubrication protection for *your* compressor units. Specify Gulf Security . . . the high quality, straight mineral oil. For full information, call your nearest Gulf office.

GULF®

GULF OIL CORPORATION, Dept. DM, Gulf Building, Pittsburgh 30, Pa.



POSITIVE INDICATION-INSTANT CONTROL OF REMOTE PUMP MOTORS AND VALVES

S&J Gardtrol units continuously report actual conditions at remote points. They also allow instant change of conditions by the operator. Gardtrol Valve Monitor shows open, opening, closing, closed or stopped (partly closed) conditions. Gardtrol Pump Motor Monitor indicates on or off. Both have simple illuminated push button controls for all functions. Only one small wire—plus a common return—is needed between control unit and the field unit. S&J Gardtrol assures reliable supervisory control at lowest cost.

SHAND AND JURS | GPE

SHAND AND JURS COMPANY 2600 Eighth Street, Berkeley, California

A Subsidiary of General Precision Equipment Corporation

Branch offices and representatives in principal cities

New AN AUTOMATIC, COMPACT **LimiTorque**

...FOR OPERATING YOUR

Plug Valves

...IN 8 TO 16 SECONDS

LimiTorque LINEAR MOTORIZED VALVE OPERATOR

...a dependable time, labor and money saver

Another LimiTorque *first* — here's the answer to the problem of motorizing your wrench (hand) operated Plug Valves . . . a simple, easily installed unit that can be built either to NEMA IV (weather-proof), or NEMA VII (explosion-proof) standards . . . an inexpensive, sturdy, fully reliable and extremely compact assembly that requires no gear changes or modifications, other than to supply a motor with the proper output speed. The *LimiTorque Linear Operator* consists of motor and double reduction gearing which drive a traveling screw and a crank that is easily mounted to the square shank of plug valve.

As noted in the illustrations, the entire assembly can be readily adapted to your plug valve while in service, by merely mounting the crank on the plug shank and strapping the support bracket to the pipe . . . The *Linear Operator* is supplied with all necessary adapting parts such as the support bracket and straps for mounting on the pipeline; also the necessary crank arm for mounting on the square shank of valve plug — The entire construction and operation is indeed simple . . . and the purchase price and installation costs are comparatively low.

A torque of 175# is developed at the valve, which is normally more than enough to drive most wrench-operated plug valves up to 6" in size. If power fails, or manual operation is desired, the mere removal of a pin (which connects the traveling screw to the crank arm) will divorce the crank from the *Linear Operator* assembly — and a bar placed in the bushed bore of the crank arm will operate the valve. (No special wrench is needed.) The mere flick of a switch to the direction of travel desired will operate the valve . . . Contact your valve manufacturer, or your nearest LimiTorque Sales Engineering Office.

Full details on this *new LimiTorque Linear Operator* are contained in Bulletin 20-58 . . . send for copy on your business letterhead.

THERE IS NO SUBSTITUTE FOR —

LimiTorque®

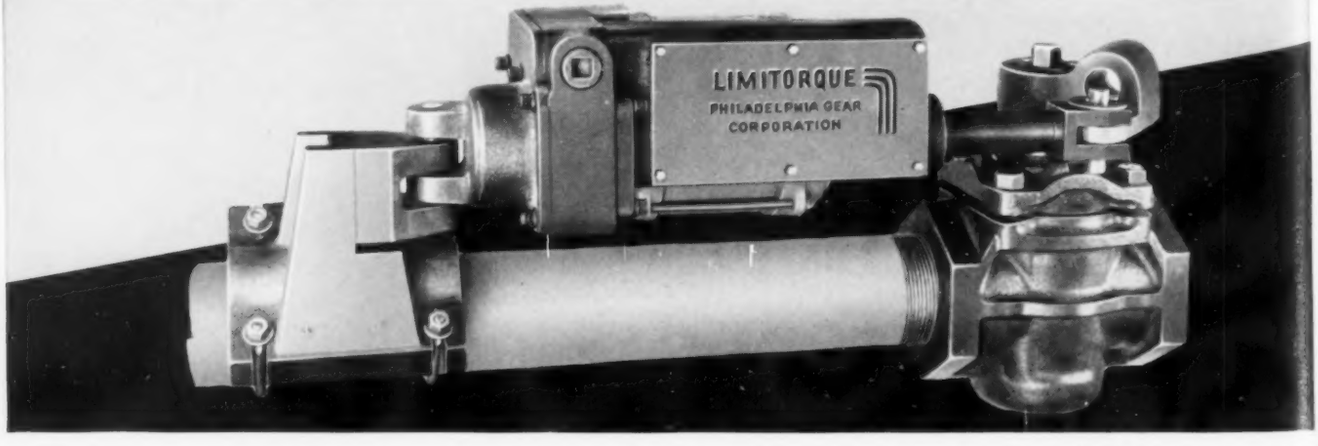
PHILADELPHIA GEAR CORPORATION

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS
LIMITORQUE VALVE CONTROLS
FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • Philadelphia



Hinged Type UNIBOLT Scraper Trap Closures conform to ASA 150 through ASA 900 Ratings, and are available in sizes from 4" through 42".

The UNIBOLT Gas Line Blow-Off Head also employs only two bolts and is hinged for easy opening and closing. The closure can be furnished with bleeder plug to safely relieve pressure which may leak through the riser valve.

catch your pig in a UNIBOLT trap!

The UNIBOLT Hinged Scraper Trap with self-sealing gasket swings open and shut like a door, and there are only two bolts to release and make up. Nothing to lift, nothing to fall on workmen, no time-consuming multi-bolt flanges, *and no leaks!* The self-sealing gasket, which rarely needs replacing, is the final answer to scraper trap leaks. Its lipped design makes it self-sealing under line pressure. The coupling cannot be over-tightened to the extent of damaging the gasket or the coupling itself.

When installed on an oversize barrel (slightly larger than the o.d. of the pig), it's easy to get a pig in and out of the trap. Line pressure does the heavy work.

These simple, convenient closures are equally desirable for gas line blow-off heads (see above), strainers, product line terminal manifolds, or any other service where pressure vessels must be opened for inspection, cleaning, repairing, connecting to a line, etc.

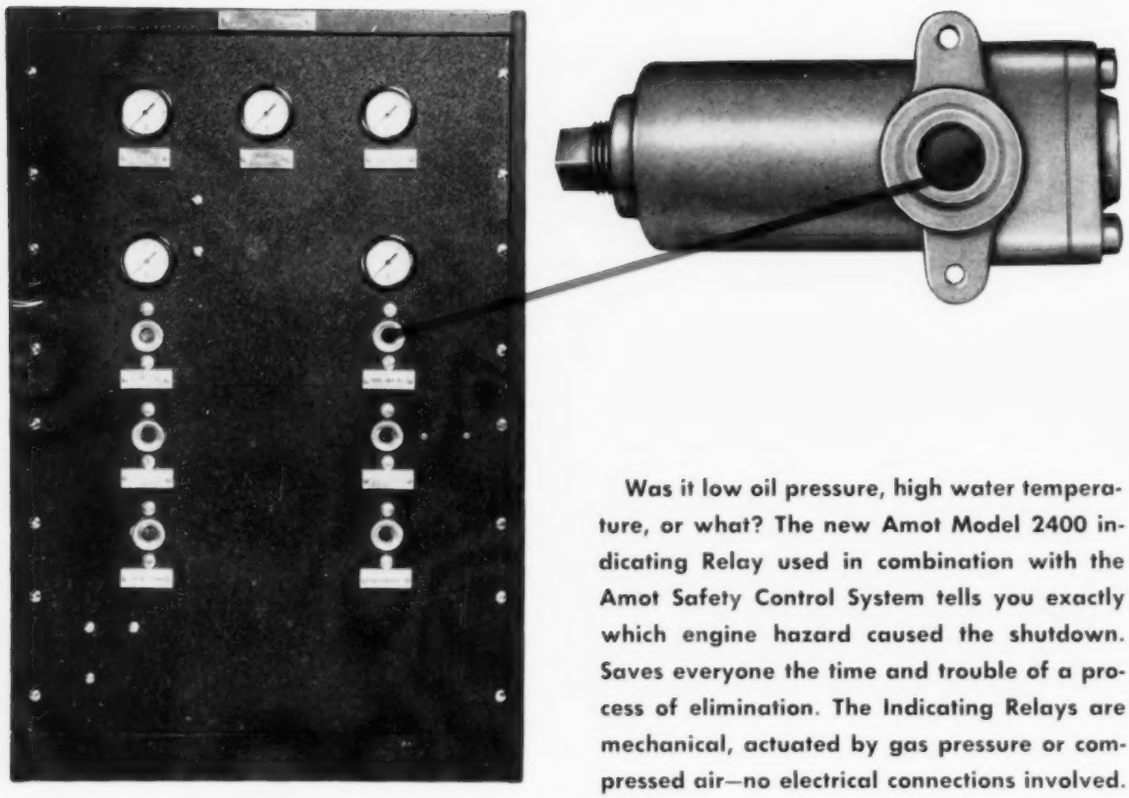
Please send for Bulletin PL-590 for complete details.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

SEE OUR EXHIBIT

MAY 14-22, 1959
Tulsa, Oklahoma

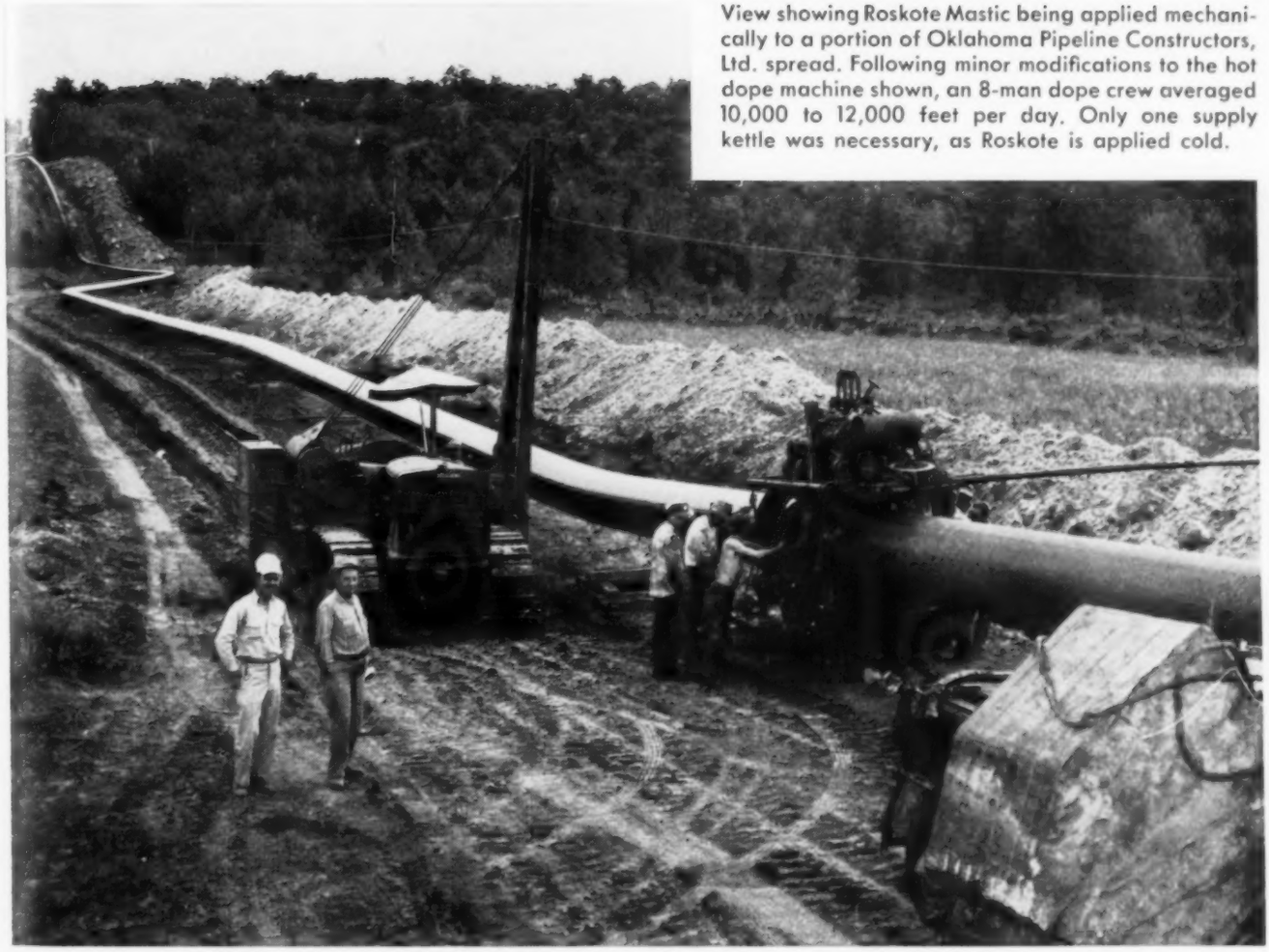
WHAT CAUSED THE ENGINE SHUT-DOWN?



Was it low oil pressure, high water temperature, or what? The new Amot Model 2400 indicating Relay used in combination with the Amot Safety Control System tells you exactly which engine hazard caused the shutdown. Saves everyone the time and trouble of a process of elimination. The Indicating Relays are mechanical, actuated by gas pressure or compressed air—no electrical connections involved. When all safety conditions of the engine are satisfied, the indicating window of each relay shows green. If a dangerous condition arises, the covering safety component vents, causing the corresponding relay window to show red—shutting down the engine. All other windows remain green. Can be installed on existing engines with no changes in starting or operating procedure. For information on components, complete systems including control panel and diagrams, write for Bulletin Q-5.3.

AMOT Pressure Operated
Fuel Shut-Off Valve

AMOT CONTROLS CORPORATION • FIRST ST. & NEVIN AVE. RICHMOND, CALIFORNIA



View showing Roskote Mastic being applied mechanically to a portion of Oklahoma Pipeline Constructors, Ltd. spread. Following minor modifications to the hot dope machine shown, an 8-man dope crew averaged 10,000 to 12,000 feet per day. Only one supply kettle was necessary, as Roskote is applied cold.

Roskote Applied Cold with Line Travel Equipment on Trans-Canada 30 Inch

Over rough terrain, with a right of way that crossed solid granite, muskeg, swamp and glacial till, and working under adverse weather conditions, the world's longest and most difficult pipeline construction — Trans-Canada Pipe Lines, Ltd. — has been completed.

One contributing factor in the success of this construction was the adaptation of standard line travel dope machines for the easy application of Roskote cold mastic. This combination of Roskote Mastic and modified line travel machines made possible the coating of ten to twelve thousand feet per day of 30-inch piping on the downstream side of the compressor stations.

Contractors* were able to carry on the coating operation with an 8-man dope crew, using only one supply kettle, requiring no heating fuel and thereby eliminating toxic fumes and fire hazard.

*Contractors on Trans-Canada who applied Roskote by line travel equipment:
Morrison-Shivers, Ltd., Majestic Contractors, Ltd., B. C. Rivers Construction, Ltd., Dutton-Williams Brothers, Ltd. and Oklahoma Pipeline Constructors, Ltd.

ROYSTON LABORATORIES, Inc.
Blawnox, Pittsburgh 38, Pa.
A LEADER IN THE FIELD OF INDUSTRIAL COATINGS FOR CORROSION CONTROL
ATLANTA • CHICAGO • HOUSTON
PHILADELPHIA • SAN DIEGO • TULSA

PL11

ROYSTON LABORATORIES, Inc.
Pittsburgh 38, Pa.

Please send me complete information about the economics and application of cold-applied Roskote Mastic with line travel equipment.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

For more data on advertised products, use Readers' Service Cards, last page.

UNCERTAINTY can be ELIMINATED in spite of the odds

Wind • Rain • Lightning • Hail • Snow • Sleet • Ice • Blistering Heat • Swirling Sand • On Stream Tanks

In the face of all these, and at finger tip convenience in an office located hundreds of miles from your pipeline stations, you want readings from **LIQUID LEVEL GAUGES – TEMPERATURE BULBS – POSITIVE DISPLACEMENT METERS – AND PRESSURE GAUGES.** You want to be notified about alarm conditions, valve positions and expect an infallible "automatic deliveryman" (L.A.C.T.). You not only want these things at a moment's notice but want them recorded in digital and alphabetical form as a documented custody transfer record. You demand **ACCURATE INFORMATION – – – RELIABLE PERFORMANCE – – – THE SCOPE AND MAGNITUDE TO HANDLE ONE OR A HUNDRED TANKS** and the **FLEXIBILITY** that will permit future expansion.

Mr. VIP – – – you are DEMANDING a

"Varec" PULSE CODE telemetering system

FOR A COMPLETE ENGINEERING APPROACH TO TELEMETERING SYSTEMS REQUEST PACKAGE 24

THE VAPOR RECOVERY SYSTEMS COMPANY • COMPTON, CALIFORNIA

SAFE SEALING WITH FLEXITALLIC

a tradition with engineers since 1912

Flexitallic Spiral-Wound Gaskets are bought for what they do . . . and keep on doing . . . in pipe lines and pressure vessels across almost all industry.

Flexitallic Gaskets are the safe seal, preferred by engineers since the development of the original Flexitallic Spiral-Wound construction in 1912.

In confining fluids at high pressures, and high temperatures, engineers know and depend on Flexitallic Gaskets because:

- The compression characteristics for a given series are always related to the bolting load for that series.
- With the gasket design determined, exacting mechanical controls assure that manufactured gaskets conform to specification.

To get this unvarying standard of quality in Spiral-Wound Gaskets, look for the blue dye in the Canadian asbestos filler — Flexitallic Blue, the mark of an engineered Flexitallic Gasket.

FLEXITALLIC GASKET CO.
8th & Bailey Sts. Camden 2, N.J.

Flexitallic®
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

*Flexitallic is a registered tradename. No one else can make a Flexitallic Gasket. Look for *Flexitallic Blue* — it's our exclusive blue-dyed Canadian asbestos filler.

A SET OF MATCHED IRONS

to improve Diesel and Gas Engine Performance

Like a golfer's set of matched clubs, each piston ring in a PEDRICK ENGINEERED SET is picked for its special ability to do its particular job more efficiently than any other ring. Consequently, PEDRICK ENGINEERED SETS are best able to meet the *individual* requirements of different engines. From top piston groove to bottom, PEDRICK RINGS deliver complete blow-by control, maximum lubrications with minimum oil waste, a more perfect seal for higher compression and longer life *plus* full power for every engine.

Whatever your requirements . . . engineered sets or single rings . . . you get more efficient performance when you specify PEDRICK PISTON RINGS. Engineering service is available to help you with special problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, SAratoga 9-3770.

Pedrick **PISTON RINGS**

PEDRICK PRECISIONEERING KEEPS PEDRICK FIRST

EXPERT STEELMAKING PROVIDES QUALITY

IN ELECTRIC WELD LINE PIPE*

Acme-Newport Steel

Pipe is no better than the steel, equipment and skill that go into it. As a basic steel producer with 74 years in the industry, Acme-Newport begins quality control with the melting and continues it through every stage of rolling, pipe forming, welding and testing. Here precision steelmaking, modern facilities and conscientious personnel combine in a product which exceeds all requirements of API, ASTM and the individual customer. Consult Acme-Newport about your requirements for 4" and 6" pipe sizes, standard or thin wall.

Acme-Newport Steel COMPANY

NEWPORT, KENTUCKY

A SUBSIDIARY OF ACME STEEL COMPANY

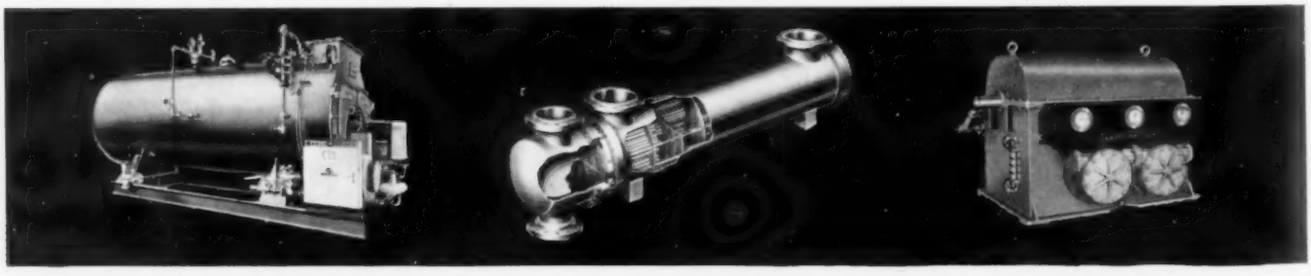
*SIZES AND WEIGHTS AVAILABLE

O.D.	Wall	Wt. Per Ft.
4½	.125"	5.84
	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.156"	10.78
	.188"	12.89
	.219"	14.97
	.250"	17.02
	.280"	18.97

To serve you better we created a new division

Now you can benefit from the combined engineering backgrounds and product lines of three American-Standard* Divisions – American Blower, Ross Heat Exchanger, and Kewanee Boiler – consolidated into one organization under a new name!

Here is one-source responsibility for quality and performance in equipment that is designed, engineered, and manufactured to work together . . . with engineer-staffed offices in major cities. Bulletin B-5829 gives all the facts on: American-Standard Industrial Division, Detroit 32, Michigan. In Canada: American-Standard Products (Canada) Limited, Toronto, Ontario.



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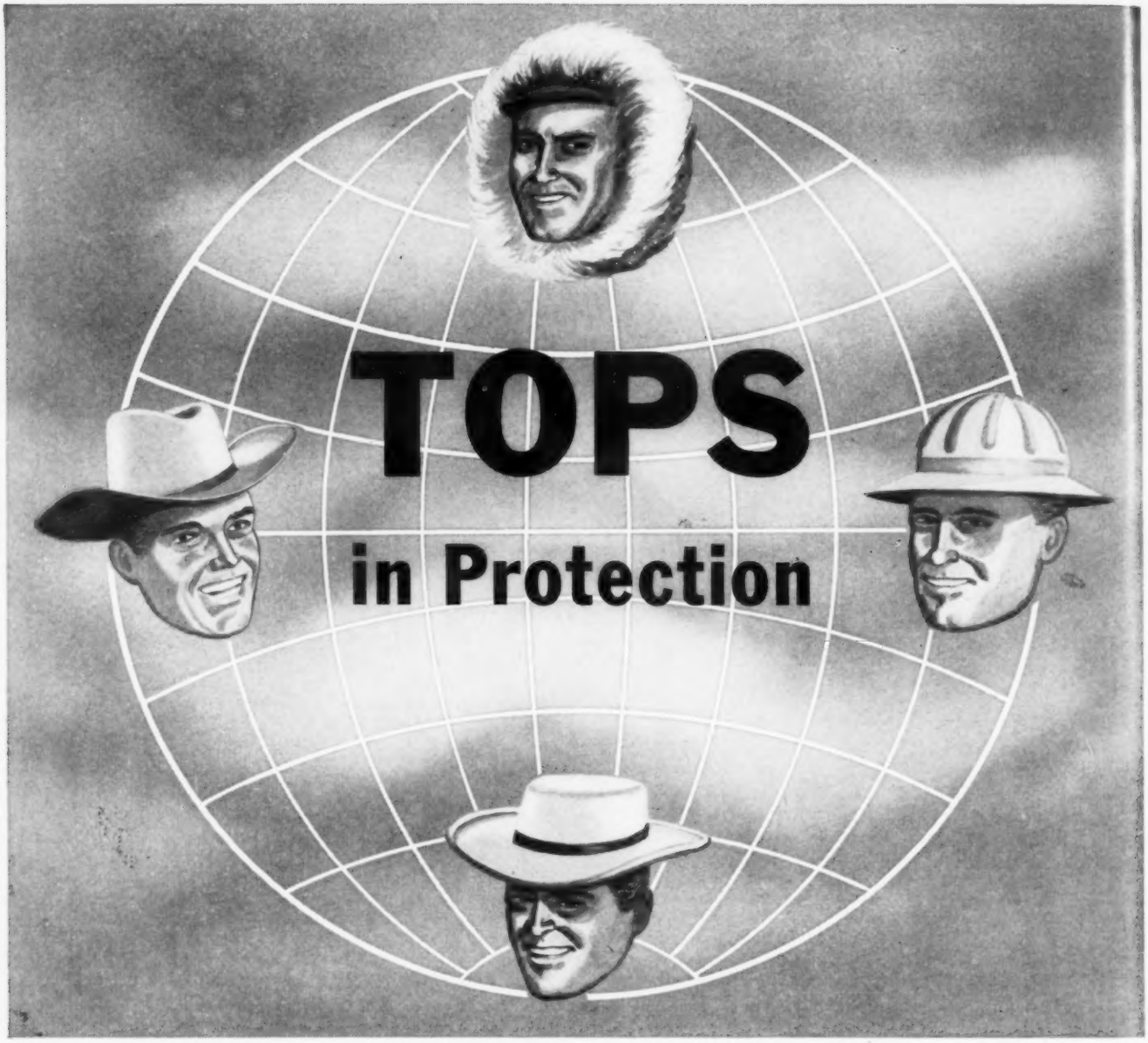

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PIPE LINE PANORAMA

Internal Coating of Gas Lines Proves Highly Successful . . . Pipe Line Industry survey shows that in past five years, four major pipe line companies have internally coated 1,300 miles of 20-36 inch gas transmission lines—400 miles more are being coated in mills and yards this year. Within few weeks, announcement will be made that internal coating increases flow efficiency enough to justify more widespread use in future gas transmission projects. Increase in efficiency: 6-10 percent or better. (See March PIPE LINE INDUSTRY, Page 60).

Look for soon-to-be-released study by Institute of Gas Technology. It will provide highly informative report on performance of materials used in several major internal coating projects.

Communications-Electrical Ideas Aired at PIEA-PESA . . . Several new concepts in communications highlight the 31st annual PIEA-PESA meeting in Galveston, April 7-9. Of particular interest: Description of design and operating experience with a dual beam microwave system; Transco's method of spray painting towers to cut microwave maintenance costs; new brushless generators.

A radical new way to dictate—using voice operated relays to operate dictating equipment; description of a remote controlled gas turbine; interesting applications of mercury lamps in pipe line operations.

How 300-horsepower motors are being started, stopped and reversed using static control and power equipment employing magnetic and semiconductor devices—instead of contactors; how to protect against static electricity.

Crude and Products Line Mileage Down, Costs Up . . . New crude and product line construction totaled 4,127 miles in '58, down 887 miles or 17.7% from '57. Conversion of crude lines to products service totaled 398 miles, down 1,508 miles or 79.1% from '57. Although mileage took sharp drop in '58, costs increased 8.3%, from $199.1 million in '57 to $215.6 million in '58. So states recent report of Committee for Oil Pipe Lines.

Major Oil Pipe Line Revenues Continue Downward Trend . . . Oil pipe line companies with revenues of $500,000 or more reported a total of $665.9 million in revenues in '58, down $4.8 million or 0.7% from previous year, according to recent announcement by Interstate Commerce Commission. '57 revenues were 1.3% under '56. Major oil pipe line volume was also down slightly, totaling 4.26 billion barrels—0.4% below '57 total.

New Competition for Natural Gas Lines? . . . According to FPC Vice Chairman W. R. Connole, international competition in natural gas may soon pose bigger problem for the U.S. oil industry than current import hassle. Basing statement on successful tanker shipment of liquid methane to England, Connole added that sales of inexpensive methane from Venezuela and Middle East to U.S. East and West Coasts may be as inviting as West European markets.

Predictions are that liquefied methane imports will hit U.S. market within five years—will compete first with high cost peak service provided to distributors by natural gas lines. Current drawbacks, i.e., maintaining low temperatures (—258° F.) in transit, storage and economics, are now being solved. Problem of aboveground storage may be answered by putting liquid methane in insulated caverns far beneath surface.

Construction along the railroad right-of-way near Cape Horn. For the most part the line follows the company owned railroad right-of-way; however, where it proved economical, the line cut across privately owned land. Weekly aerial patrol inspects pipe line R.O.W. and observes conditions that may be detrimental to the railroad.

SP Completes a Year's Run In the High Sierras

Despite landslides, 10- to 20-foot snows and sub-zero temperatures, the first year's operation of this San Francisco-to-Reno products line proved almost trouble-free. Here's the way it came about

By W. T. Eskew, Jr.
Chief Engineer
Southern Pacific Pipe Lines, Inc.
Los Angeles

Because of rugged terrain, high operating pressures, and severe winter conditions, difficulties were expected on the Southern Pacific's products pipe line from San Francisco to Reno and Fallon, Nevada; however, with few exceptions, the first year of operation was completed with little trouble. Unseasonal rains during the first winter created floods, severe erosion problems, and even numerous landslides in the Concord area. Such landslides are not uncommon in this area due to the soil conditions, but severe stresses were imposed on the pipe line at a number of points. Fortunately, the line held and did not break. The line was stripped out in each instance to relieve the excessive loading, and stabilization drain trenches were constructed on the high side of the pipe line to drain subsurface water.

In the mountainous 7,100-foot Donner Summit area where snow pack conditions of 20 to 30 feet can be expected, block gate valves were equipped with 21-foot extension handles and pole-mounted operating platforms. Twenty to thirty foot pipe line markers were used in the critical areas, and pole-mounted rectifiers were installed to aid the winter maintenance problems.

These are a few of the solutions to special problems that were encountered in the design and initial operation of the system which connects the various refineries in the San Francisco Bay area with the markets in the Reno, Nev., area. This 10-, 8- and 6-inch line follows the Southern Pacific railroad for much of this distance, departing from it where necessary. It starts at Richmond, runs to Concord and swings over by Stockton and up around the outskirts of Sacramento through Roseville and Colfax, over Donner Summit, through Truckee, and on into Reno. From Reno, it extends 60 miles to the Naval Auxiliary Air Station at Fallon, Nev.

Line Sizes. API 5 LX 46 pipe was used throughout, 97 miles was seamless. Line size varies considerably. The first 22-mile section between Richmond and Concord is 8-inch; for the next 107 miles between Concord and Roseville it is 10-inch. It reduces to 6-inch between Roseville and Colfax and between Colfax and Truckee, it is 8-inch. From this point to Fallon, Nev., the line is 6-inch.

The line between Richmond and Concord is a part of the trunk system but could be called a "gathering" line since some shippers inject from their refineries in the Richmond area, while others pump from their refineries in the Concord area. The 10-inch line from Concord to Roseville was sized to take additional volumes from

both Richmond and Concord refineries and to provide expanded capacity for future volumes.

Shipper estimates indicated that a 6-inch line from Roseville to Reno would provide adequate throughput; however, in designing such a system using 6-inch pipe, a pump station would have been required at Emigrant Gap near Donner Summit, which is in the deep snow country of the High Sierras. Even a remotely controlled station at this point would have presented numerous problems during the winter months; therefore, the line size between Colfax and Truckee was increased to 8-inch to eliminate the need for such a pump station at the present designed throughput.

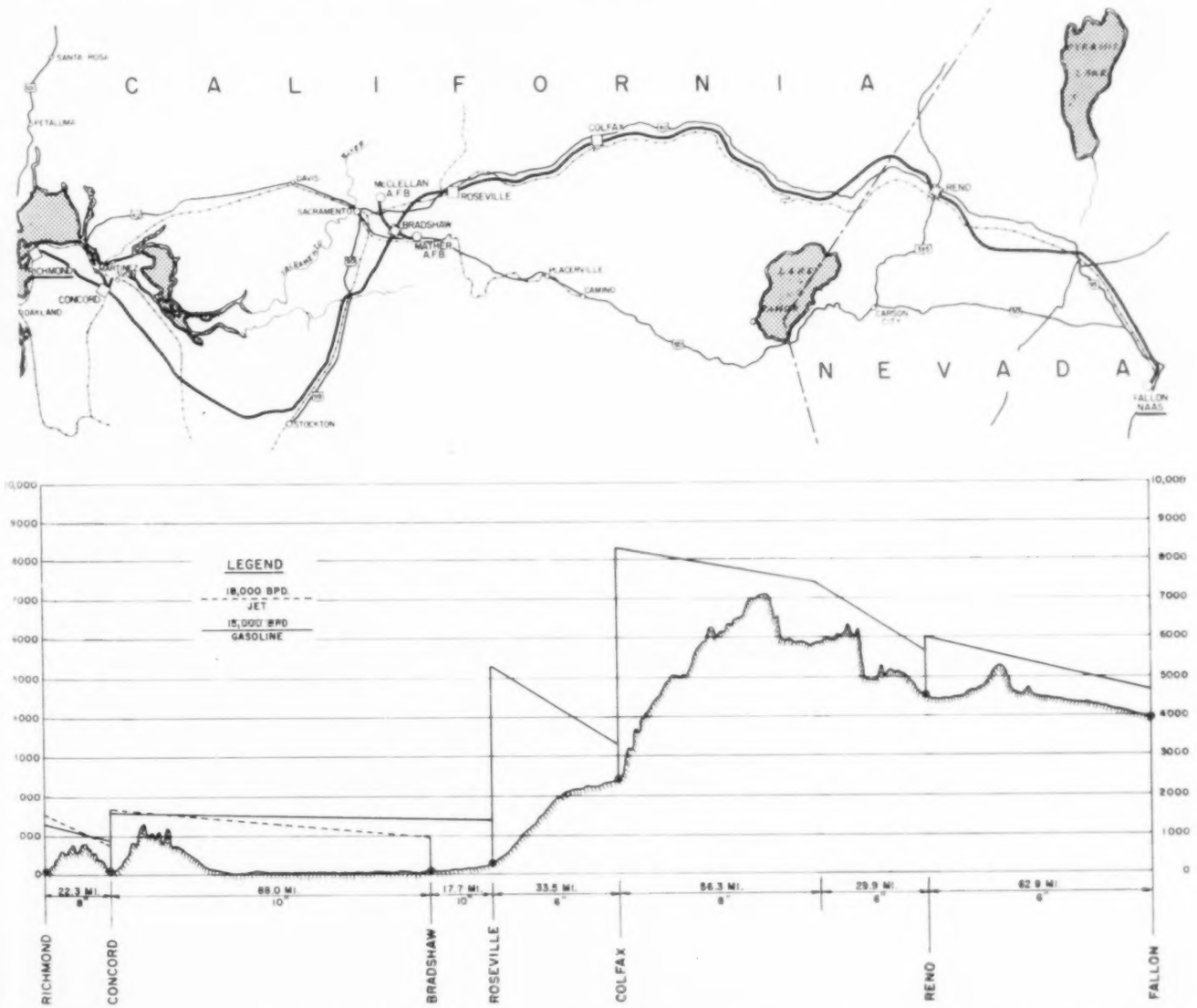
Throughput. The designed capacity of the new system is 15,000 barrels per day from Richmond to Reno. This can be increased to 42,000 barrels per day to the Roseville area, and 20,500 barrels per day into the Reno area by adding additional horsepower.

CONSTRUCTION

Actual pipe line construction was accomplished by four different contractors, utilizing for the most part conventional pipe line practices. The terrain varied considerably—from congested paved city streets in the Richmond and Concord area to peat lands near Sacramento, irrigated farm lands in California's central valley, granite gorges, 7,000-foot jagged peaks in the Sierra Nevada Range, numerous river and stream crossings, and finally, desert lands between Reno and Fallon. Approximately 7 percent of the route contained hard rock which required blasting. Most of this was in the solid granite areas in and near Donner Summit.

Railroad R.O.W. In general, the pipe line followed the Southern Pacific Railroad right-of-way where practical; however, because of grade restrictions in the mountainous areas, limited available space on the narrow right-of-way at some points, and the extremely high cost of construction, it was not possible nor economical to follow the railroad right-of-way in its entirety. The pipe line route selected utilized private lands when economical.

Ditch Specifications. The ditch was 20 to 24 inches wide, depending on size of the pipe, with a normal cover of 30 inches above the top of the pipe.



Route and profile of Southern Pacific Pipe Lines' products system linking San Francisco Bay area refineries to Nevada markets. Right-of-way climbs from sea level at the western terminus to over 7100 feet across Donner Pass and the Sierras. Special attention was given to mountain operations in design and construction of the system.

This was increased to 48 inches in creeks, gulches, ravines etc. In solid rock, 24 inches was sufficient, but when the line was within 50 feet of the railroad tracks 60 inches was required. Allowable bending was specified as 40 times the outside diameter of the pipe with a stipulation that the longitudinal seam in electric weld pipe be placed at the neutral axis of the bend—on vertical bends, at the side, and on horizontal bends, at the top.

Welding. Rod sizes were as follows: 5/32-inch for all stringer and second beads; 3/16-inch or ¼-inch for subsequent passes. Roll welds were permitted on finished welds only with not more than three single lengths of pipe in a section to be roll-welded. Preheating was required when the ambient temperature was such that the quality of the weld was subject to cracking at any time during the welding. Radiographic methods of inspection using the gamma ray were used on a large number of representative line welds.

Coating. Four different grades of coating materials were used. In general, ½-inch thick, plant-applied asphalt mastic coating was used on river crossings and major "hot spots." Plant-applied double-coat, double-wrap asphalt coating consisting of asphalt primer, enamel with 13-pound asphalt-saturated rag felt followed by 20-pound asphalt-saturated rag felt, was used in the heavily congested areas. Plant-applied, single-coat, reinforced, single-wrap asphalt coating was used throughout the remainder of the system except for a few short sections in which "over the ditch" wrapping was allowed.

River Crossings. Major river crossings consisted of Indian Slough, Old River, Little River, San Joaquin River, and the American River. All crossings are under water with the exception of Trappers' Slough which is supported above water on wooden pile bents.

Main Line Valves. Main line block gate valves were spaced at intervals of 20 to 30 miles. All of them are through-conduit type to permit the passage of scrapers. Weld-end valves were specified to eliminate flange leakage. Tapping nipples were installed on each side of block gate valves for ease in installing vent or drain connections for future maintenance.

Cathodic protection rectifier on a pole! Explanation: The location is in the High Sierras where snow packs 20 to 30 feet thick are common. Valve operating platforms are also pole mounted and all of the main line block valves in the Donner Pass region are equipped with 21-foot extensions for the hand wheels.

There are approximately 360 cased crossings on the system, and it is interesting to note that in certain cases, particularly for crossing under railroad roadbed fill, it was necessary to install 24-inch casing. Explanation for the large size was that large rocks in the fill required that a man get inside the casing and remove the rocks ahead of the boring machine.

Rock Ditching. Specifications provided that in rocky areas pipe was to be protected by a sand pad or rock shield; however, due to the unavailability of sand in most areas, rock shield was used extensively. In fact, in certain areas, particularly around Donner Summit, it was not possible to find suitable material for backfill; rock had to be used. During backfill the pipe line was protected manually from damage by men in the ditch.

Testing. Upon completion of construction the line was split in numerous test sections and hydrostatically tested to a pressure approximately 90 percent of yield.

STATIONS

Input pump stations were required at Richmond and Concord, Calif. with additional booster pump stations at Roseville and Colfax, Calif. Delivery terminals were constructed at Bradshaw Road (near Sacramento) for delivery of product into storage and further repumping through small diameter lateral lines to Mather and McClellan Air Force bases and at Reno and Fallon, Nev. Military fuels, destined for Fallon are placed in intermediate storage at Reno, checked for quality control and subsequently repumped to Fallon, Nevada Naval Auxiliary Air Station.

At Richmond Input Station, product from three oil companies located 1 to 2 miles away is injected directly into the incoming manifold header, and their pumping facilities have been designed to match the characteristics of main line pumps so that products can be received directly into suction without the use of tankage. Likewise at Concord two additional refineries, located 2 to 5 miles away, inject their product at that point. Booster pumps at refineries are designed with adequate additional capacity to facilitate proving of positive displacement meters without affecting system flow during calibration.

At Richmond pump station, motor operators were installed on the incoming line from each shipper to permit a flying switch from one refinery source to another. A pressure-control valve in the pump suction line provides protection against over-pressuring equipment on the suction side of the station. One operating pump and a spare have been installed in parallel. Pump differential was based on the required pressure to pump over the highest hills between Richmond and Concord rather than on the total friction drop. Accordingly, considerable residual pressure is in the line at the Concord incoming manifold. Back pressure must be maintained to prevent cavitation on the intermediate hills.

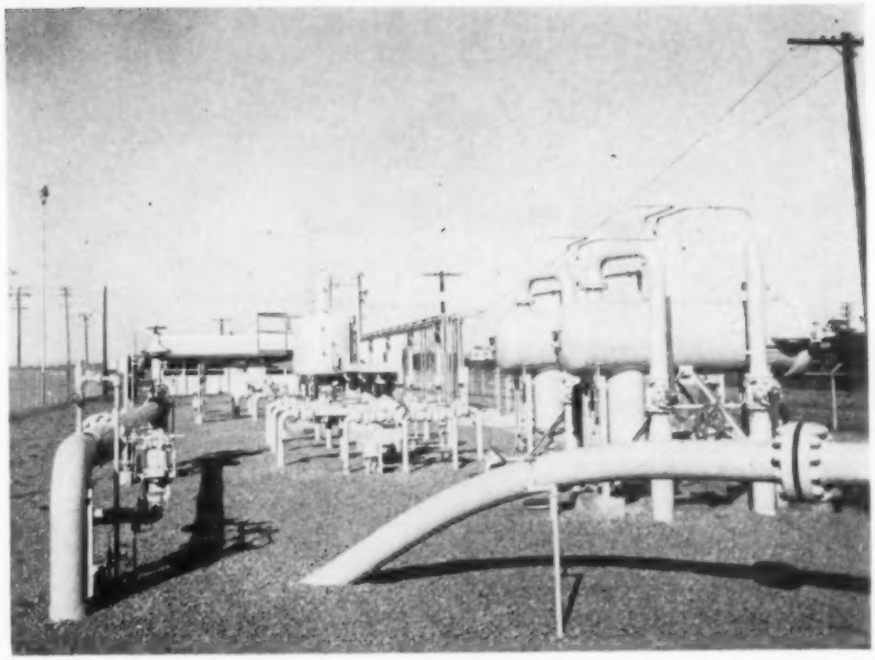
Concord Station. At Concord, the incoming manifold is also equipped with motor-operated valves to handle the two shippers' incoming lines, the incoming main line from Richmond, and the tank booster pump. The manifold is arranged so that flying

switches may also be made with any line from the main pump suction header to delivery to the tank-filling lines.

At this location, the operating pumps are installed in parallel. Protection against overpressure of equipment on the suction side of the station is provided on the incoming line from Richmond as well as from one of the refineries. The other refinery does not require such control for initial pumping conditions. The control valve on the line from Richmond also acts as a back-pressure control to prevent cavitation between Richmond and Concord.

Roseville Station. For initial flow rates and pressures the station suction does not require protection against over-pressure. Residual pressure is thus available for use with the two operating pumps. Two operating pumps and one spare are installed in series.

Colfax Station. Three operating pumps and one spare are installed in series. Since it is possible to overpressure the station suction at reduced flow, a control valve governed by a dual controller was installed in the incoming suction line. One control point is in the incoming suction pressure to the equipment and pumps; the other is the contained station pressure downstream from the last pump and ahead of the discharge line pressure control. The control prevents over-pressure of both the station suction and discharge piping. A flow control is provided to over-ride the dual "low suction-high line pressure" control (actuating the station discharge control valve) in order to restrict flow throughout the entire line to that required by horse power limitations or motor drivers and to prevent cavitating the line between Concord and Roseville.



Richmond Pump Station in the refining area near San Francisco. Several refineries inject at this point. Control building is in the background.

Because of extreme static conditions between Colfax Station and Donner Summit (1,500 psi on average product), it is very important that pumping units at Colfax be brought on the line in rapid succession to avoid "lock-out" during start-up.

PUMP STATION DESIGN

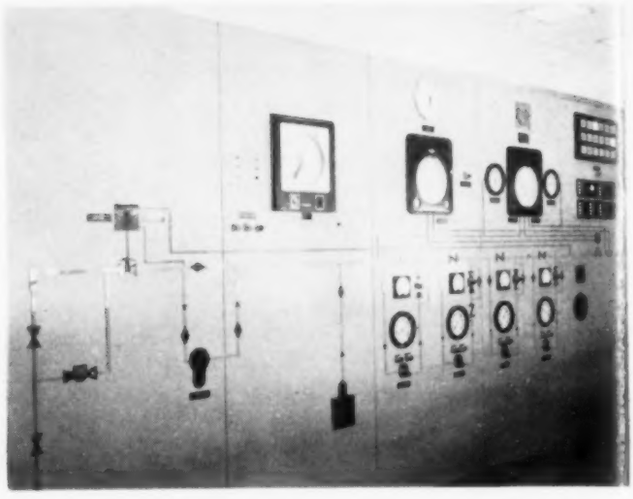
Except for minor variations, pump stations at Richmond, Concord, Roseville, and Colfax are similar. All are equipped with weather-proof electrically-driven centrifugal units of the following sizes:

- **Richmond**—two 150-hp, 3 by 4 MSB horizontal split case, single suction connected in parallel
- **Concord**—two 200-hp, 3 by 4 MSB double volute, horizontal split case, single suction, connected in parallel
- **Roseville**—three 250-hp, 3 by 4 MSB, double volute, horizontal split case, single suction, connected in series

Two more refineries inject product at Concord Pump Station. The main pumps are at the center; prover tank, meters, filter-separators are at the left.

Control building at Concord Station. The control valve on the suction line functions to protect against high pressures and to prevent cavitation on the line from Richmond.

Typical sampling and sample storage building is located for minimum length sampling lines.



From the Colfax control board operator can stop and start main units, operate suction and discharge valves, set discharge dual controller and perform emergency shutdown.

• **Colfax**—four 250-hp, 3 by 4 double volute, horizontal split case, single suction, connected in series

All pumps are equipped with bronze trim and mechanical seals.

Discharge pressures on products are 450, 580, 1,650, and 2,100, respectively, under present operation.

Minimizing Contamination. Conventional flow pattern through-station piping was modified to eliminate pockets that could create contamination. On long manifold headers, such as incoming shipper headers, delivery manifold headers and, in some instances, tank farm manifold headers, a baffle plate was installed nearly the entire length of the header to force each batch to sweep the preceding products clean.

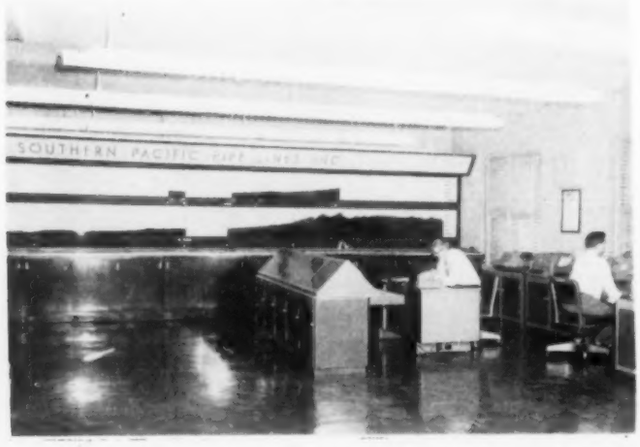
P. D. Meters. Positive displacement meters are used at all input stations and delivery terminals for product custody transfer. Correspondingly, each pump station and terminal, so equipped, were provided with an adequately-sized prover tank and necessary piping. After calibrations, product in prover tank is subsequently drained to sump tank and repumped into the system.

Water Separator-Filter Tanks were installed at each pump station for removal of water, dirt, and other foreign matter. Also, an oil-water separator was provided in the drain system as further protection for water removal before product is drained to the sump tanks.

Sizing Equipment. In general, pumps, meters, separator filter tanks, etc., were sized and rated for an orderly increase in capacity with identical equipment to ultimate flow rates. Where this was impractical such equipment was either purchased for ultimate flow rates or for rates in excess of initial requirements which would permit an orderly and economic development to ultimate capacity.

Switch gear. All station main switchgear bus and circuit breaker capacities were also designed for ultimate line rate horsepower which can be accomplished by in-line addition of motor starter cubicles to existing switchgear structure.

Sampling Facilities and Gravitometer installations were provided in a small metal building, appropriately located for minimum length sample lines.



Products movement department in Los Angeles. Southern Pacific operates via privately owned teletype and telephone circuits to each pump station, terminal and district headquarters.

Pump station at Roseville. The three pumps are 250 hp each 3 x 4 MSB, double volute, horizontal split case, single suction connected in series. One serves as a standby.

Relief Valves. All stations and terminals except Roseville and Colfax are equipped with full flow pressure relief valves to protect low-pressure piping and equipment from excessive upstream pump station and static pressures. These valves discharge directly to the sump tank. Roseville and Colfax are equipped with Series 30 suction facilities.

CONTROL SYSTEMS

The control buildings at all pump stations are identical, except for minor differences in control and switchgear rooms. In addition to the control room, an office is provided for the station manager as well as an adequately-sized combination warehouse-workshop room.

In the control room, mirror image piping is shown on a vertical control board at the rear of the room. From this point the operator can:

- Start and stop main line units
- Operate motor-operated valves on incoming lines and discharge valves on each main line unit
- Control station discharge dual controller
- Perform emergency shutdown.

Recording chart instruments are provided for flow, pump suction, and station discharge pressures.

Indication only is provided for (1) incoming line pressure, (2) station suction pressure, (3) case pressure on each unit, (4) station discharge pressure, (5) sump product level, (6) amperes on main line units, and (7) bearing and case temperatures on selection.

With the use of a scan panel, alarms and lights indicate the following: (1) low suction on each main line unit, (2) high and low station suction pressure, (3) high and low flow station discharge, (4) high and low station discharge pressure, (5) high sump tank level, (6) low instrument air pressure, (7) high case temperatures, and (8) high bearing temperatures on both pump and motor.

Main line units are protected with "shutdown" devices on each of the following: (1) high case pressure, (2) high bearing temperatures on pump and motor, (3) low suction pressure, (4) high station discharge, (5) overcurrent and (6) undervoltage.

Aerial view of the Reno terminal. Capacity of the tankage is 280,000 barrels. One of the unusual features of this terminal is that truck drivers actually operate the loading racks under supervision of pipe line personnel, therefore minimum manpower is required.

DELIVERY TERMINALS

In offering its commercial shippers the most economical operation, the pipe line company constructed, in addition to the normal pipe line delivery terminal, storage tankage and truck loading rack facilities for each shipper. Truck drivers actually operate the loading rack under the supervision of pipe line personnel; minimum manpower is required.

Reno Terminal. At Reno, the largest terminal on the system, facilities include water separators, jet cleaning strainers, meters, prover tank, sump, etc. Tankage consists of 16 tanks varying in capacity from 3,000 to 30,000 each for a total of 280,000 barrels.

An enlarged control building, including control room offices for terminal manager and clerical forces and a fully-equipped pipe line control laboratory were provided.

At Bradshaw Terminal, normal pipe line terminal facilities are provided with 220,000 barrels of break-out tankage for military products. After quality control, product is repumped through small diameter lines to military terminal facilities at Mather and McClellan Air Force bases.

Delivery terminals at Mather and McClellan Air Force bases and at the Naval Auxiliary Air Station in Fallon are similar. Facilities consist of water separator, meters, prover tank, sump, etc. A small prefabricated metal building provides space for electrical and communication equipment, as well as necessary office space for operator. Previous quality-controlled product is delivered direct to military tankage.

PUTTING THE LINE IN SERVICE

A steel strike and severe construction problems created two somewhat unusual situations. First, pump station construction contracts were awarded early in the year, being scheduled for completion simultaneously with the pipe line; however, with delayed pipe line construction, all of the stations were completed well ahead of the pipe line. It was most unusual to start up a new pipe line with all pump stations completed, tested, and painted before initial operation.

Preventing Ice. Secondly, the pipe line from Roseville to Reno over the

High Sierras was completed and hydrostatically tested before the section from Concord to Roseville. The possibility of an early winter, with corresponding low temperatures, and the line standing full of water, created an illusion of an icicle 30 to 40 miles long over the Sierras, which would probably further delay initial operation until the spring of 1959. Due to extremely hilly terrain it was considered impractical to tap and drain all low spots. Filling the line with product seemed the best solution.

With the pipe line passing near the Southern Pacific Roseville railway yard, it was not too difficult to use one of the existing railway spur tracks, fabricate a temporary ten-tank-car unloading facility, install portable pumping units, and make a temporary connection to the pipe line. Tank cars were loaded with house-brand gasoline in the Richmond area and shuttled into the Roseville yard for injection into the pipe line. Approximately 52,000 barrels of water used for hydrostatic testing was displaced with this product and freezing possibilities were eliminated.

Full operation was begun in early December, 1957.

SCHEDULING AND DISPATCHING

With privately-owned Southern Pacific Company teletype and telephone circuits to each pump station, terminal, and district headquarters, the existing Products Movement department in Los Angeles also handles scheduling and dispatching on the new system. By the use of a miniature pipe line mounted on a scheduling board and calibrated to exact line capacities, the movement of product through the pipe line is controlled at all times.

Telemetered Suction and Discharge pressure from each pump station and terminal are also provided to the Products Movement department, utilizing these same privately-owned circuits. Such intelligence has been extremely useful in observing line conditions during scheduled shutdowns.

OPERATION

This addition to S.P.'s 1,366 mile system required the establishment of a new Northern District for handling its operation and maintenance. Centrally located Roseville, Calif., was selected as the location for district office facilities, and a combination office-warehouse building was constructed near the Roseville pump station for this purpose. Office space for the district superintendent and his staff of mechanical, electrical, maintenance, and clerical personnel was provided in addition to space for warehouse facilities for the entire district.

SPECIAL WINTER PROBLEMS

To cope with the 20- to 30-foot snow pack in the High Sierras, block valves in this area were provided with a 21-foot extension for the hand-wheel. An adjacent pole, equipped with platform, facilitates operation as necessary. For maintenance purposes, cathodic protection rectifiers in this area were also installed on poles equipped with platforms.

"Snow-Cats," equipped with sleds used by various maintenance departments of the Southern Pacific Company, and pipeliners, equipped with snowshoes, are ready for their first emergency in that area. In certain areas where the pipe line right-of-way is not easily located during heavy snow-pack conditions, the line is marked with a 10-to 25-feet orange wooden pole marker that can be easily removed during the summer months.

Patrol. Weekly aerial patrol is contracted. Blind canyons, precipices, hairpin curves, and the 7,200-foot high Donner Pass encountered in following the railroad and pipe line in the High Sierras brought out the fact that a suitable plane had to be equipped with high altitude engines, similar to those used by the Army for low-fiying liaison and by crop-dusters. This patrol has been extremely helpful in spotting landslides, snowslides, washouts, encroachments etc.

During original construction, test leads were installed at all crossings and at 4-mile intervals. During the first year of operation, corrosion crews designed and installed rectifier stations along the system as necessary for complete protection.

INITIAL OPERATING PROBLEMS

The first year of operation has not been uneventful. An unusually rainy winter caused floods and severe erosion problems. Numerous landslides, quite common in the Concord area caused severe stresses on the pipe line on a number of occasions. However, the lines did not rupture. Stabilization drain trenches on the high side of the new pipe line and extensive surface grading were necessary to correct this problem.

OTHER CONSTRUCTION

In addition to the new Richmond-Fallon System, a new 29-mile, 6-inch lateral from Niland to Imperial, was placed in operation in January, 1958. A commercial terminal at Imperial was constructed along with 6.5 miles of 4-inch line and a delivery terminal to serve the Naval Auxiliary Air Station at El Centro.

During May of 1958, four new remote controlled pump stations were also completed on the original 8-inch line between El Paso and Tucson to increase the capacity on that system from 14,500 to 36,000 barrels per day. —**The End**

About the Author

W. T. Eskew, Jr., chief engineer of Southern Pacific Pipe Lines, Inc., started in the pipe line business with Plantation Pipe Line Company shortly after graduating from Duke University with a B.S. in mechanical engineering some 14 years ago. In ten years at Plantation he was a field engineer, acting supervising engineer and division engineer. He joined Southern Pacific in 1955 as chief engineer. Eskew is a native of Anderson, S. C.

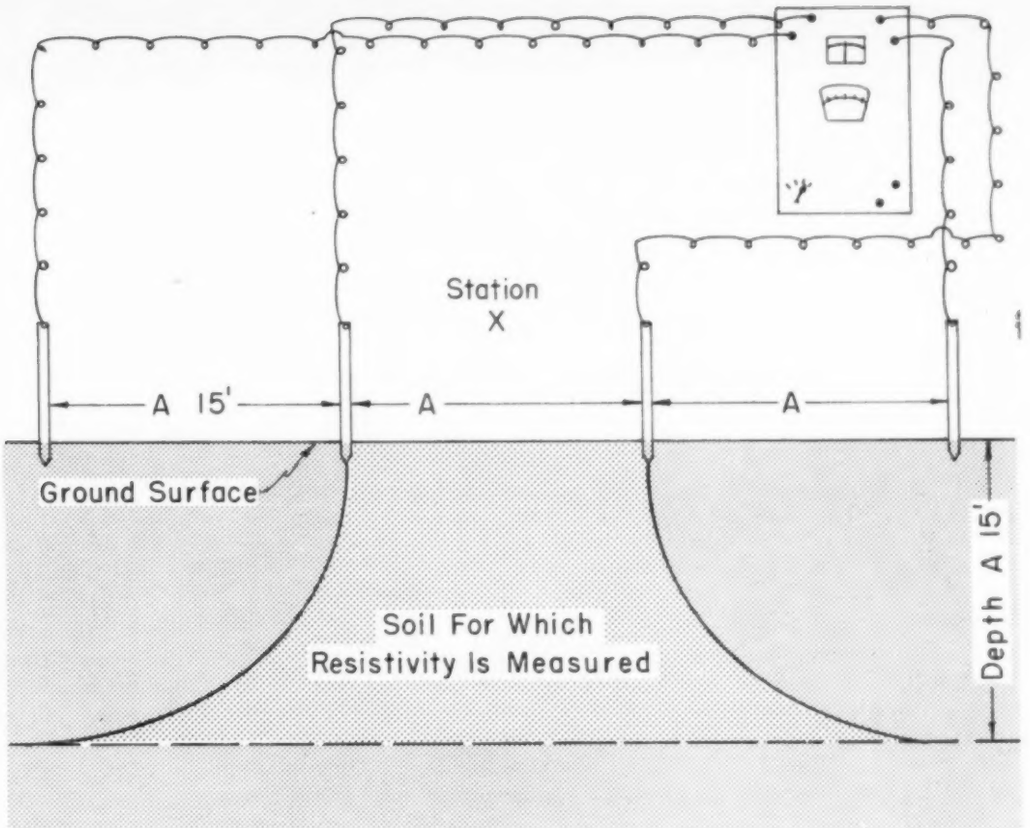


FIGURE 1—Electrical survey to a depth of 15 feet. This method can be used to detect the presence of rock, sand, gravel etc. and to actually determine the depths from the surface. In principle, this method is not unlike the surveys used in oil and gas wells to determine the tops of subsurface strata.

Electrical Survey Detects Underground Rock

Contractors may be able to better estimate the costs of ditching with this resistivity survey which not only shows the presence of clay, rock etc.—it also shows depth

By **Howard E. Barnes,**
Michigan State Highway Department, Ann Arbor

AN ELECTRICAL resistivity survey is proving popular among highway departments these days. It is being used to study underground soil conditions without the usual drilling, probing and digging. Readings from inexpensive survey instruments can be interpreted to give the depth of subsurface rock, gravel, sand, etc.

This survey may prove highly valuable in the pipe line construction field. In the past, a number of pipe line contractors have gone bankrupt drilling and blasting rock which was not exposed on the surface and as a result not entered into the bid price.

What Earth Resistivity Surveys Can Do. One particular field can often "leapfrog" a problem by adapting methods and devices used by other fields. In this instance, pipe line contractors, long plagued by the uncertain quantities of hidden rock may find the technique a ready-made answer to more intelligent bidding.

Through resistivity surveys it is possible to determine the type of soil at any practical depth for a reasonable cost. The most valuable application in the pipe line construction field would be to determine the depth to top of rock lying below the ground surface but within the depth range of ditching operations. Another use would be for determining whether the soil in a deep cut area is of the clay or granular nature. This information becomes quite significant when ditching is being considered.

Earth resistivity is a geophysical method of subsoil differentiation based on the fact that different types of soil develop different inherent resistances to the passage of an electric current. Although the method has been known for more than half a century, it has come into prevalent use for the highway engineering profession only in recent years. In general, resistivity

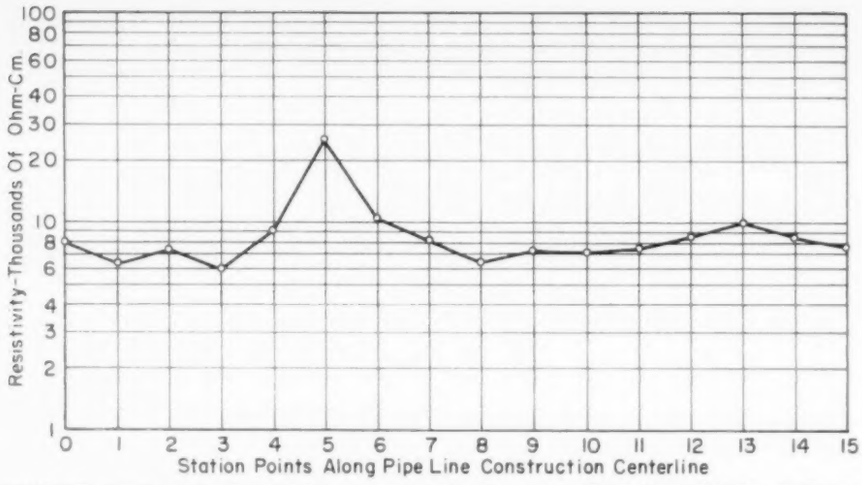


FIGURE 2—Record of a 15-foot constant depth survey. Peak in resistivity indicates the presence of rock in the vicinity of survey station five.

values are small for clay type of soils and increase as the soil texture increases. Consequently, sands have greater values than clay, gravels have greater values than sand, and rock usually exhibits the highest range of values.

History of the Method. In 1915 a system was proposed by Dr. Frank Wenner, then of the National Bureau of Standards, by which he demonstrated mathematically that if four electrodes were placed in the ground surface along a straight line, equidistant apart, the resistance of a layer of soil equal in depth to the distance between electrodes could be measured. The general equation expressing this fact is as follows:

$$\rho = 191\ A\ E/I \text{ or } 191\ A\ \bar{R}$$

where:

ρ = resistivity of the soil layer in ohm-cm.
A = depth of soil layer and distance between electrodes in feet.
E = voltage drop measured between the inner two electrodes in volts.
I = current applied through the outer two electrodes in amperes.

Early troubles. The above equation was based on the use of direct current and; although at first glance it appears quite simple, there were many pitfalls to overcome in obtaining satisfactory results. Initially, such obstacles as stray ground currents, electrode contact resistances, and sensitivity of instruments were most troublesome.

Present-day instruments, however, are small and compact, weighing less than 25 pounds, operating from a dry-cell battery source and producing relatively low frequency commutated alternating current. The influence of stray currents has been eliminated and electrode resistance is no longer a worry.

Step-By-Step Procedure. The general procedure for obtaining subsurface information is relatively easy and fast depending upon the degree of comprehensive information desired. Assuming that information is required concerning the presence of rock in a suspicious area along the proposed line of ditching, let us quickly run through the procedure for a hypothetical case.

Equipment. First of all, certain equipment is necessary. This equipment will consist of:

- A dependable resistivity measuring instrument
- A minimum of four brass or bronze electrodes ¾-inch diameter and about 20 inches long
- Two hammers for driving the electrodes into the ground
- Two tapes for measuring the spacing between electrodes
- Sufficient wire and fasteners for connecting the electrodes to the instrument.

Surveying to 15 feet. Assume further that the proposed grade line through the questionable area lies at a maximum depth of 15 feet. In order to determine the presence of rock within the construction depth, a constant depth survey would be required. This type of survey involves making resistivity soundings at points every 15 feet along the centerline of ditch construction. At each sounding point the electrodes will be spaced 15 feet apart as shown in Figure 1. The reading obtained will be the value of the average resistivity of the first 15 feet of soil. When the readings of all the soundings in the area investigated have been obtained, they are plotted on a graph as shown in Figure 2. Because most bedrocks yield a relatively high resistance to an electrical current, it is a simple matter to observe from the graph those stations having the high values which are indicative of buried rock within the 15 foot depth of cut. Note value at point five.

Finding the depth to rock. Now that we are aware of the probable presence of rock, we should find out how far below ground surface it is to the top of rock. Consequently, some system involving depth relationship must be employed. One such system is widely used in searching for gravel deposits and in constructing high-

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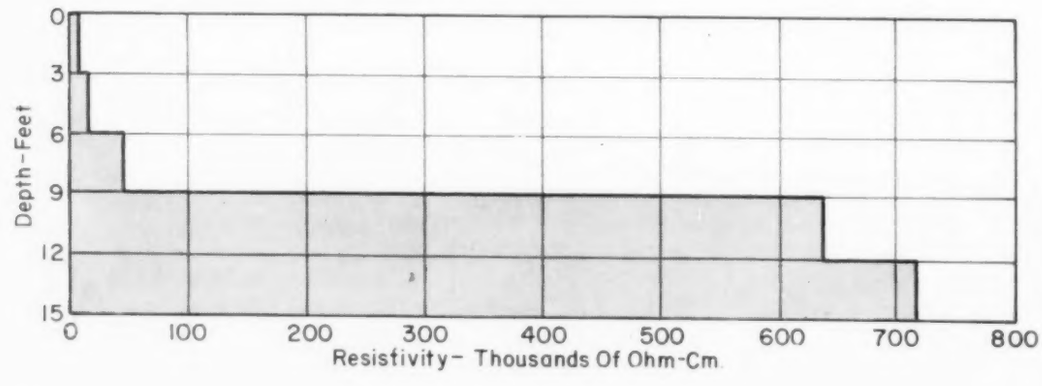
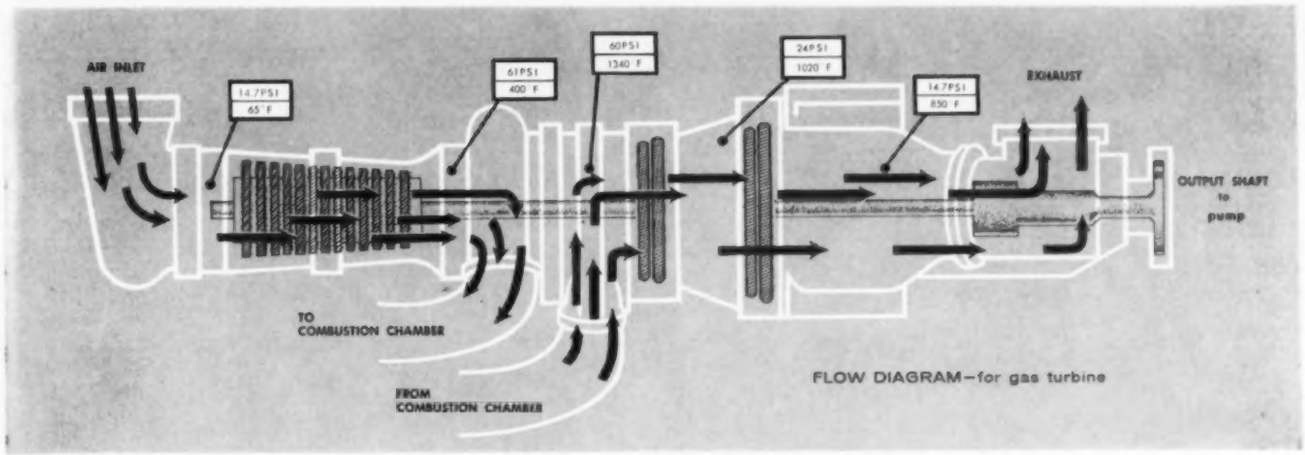


FIGURE 3—Using a graphic means of showing depth of rock. Any resistivity above 300,000 ohm-cms can be taken as indicative of rock. Depth of rock here is about nine feet.



Schematic flow diagram of the 1,150 hp gas-fired turbine on the Great Lakes system. If you have never quite understood how a turbine works, just study this drawing a few minutes. First, you'll note that the pressures involved are much lower than you suspected. Summed up, here's the way it works. The axial flow compressor takes in about 300 cubic feet of air per second, compresses it to 61 psi. The air is heated in the combustion chamber to increase its volume, and then it expands across the blading of the turbines to provide the motive power to drive the compressor and the load shaft.

On Great Lakes line . . .

Gas-Fired Turbine Is Working Out

The first turbine to be installed on a products line is rated at 1,150 hp. This small size turbine which uses natural gas as a fuel, may prove popular on other products lines

EARLY LAST YEAR Great Lakes Pipe Line Company installed a 1,150-hp gas-fired turbine on its new 12-inch Tulsa-Barnsdall line. The turbine drives a single-stage, double-suction pump built especially for this service. At full capacity it will handle 3,950 barrels of products per hour discharging at 630 pounds per square inch. This capacity is the equivalent of two 6-cylinder diesel engines, each driving three-stage pumps on the company's other 12-inch Tulsa-to-Barnsdall line. Actually the turbine-driven pump has gone as high as 4,200 barrels per hour.

How a gas-fired turbine works. If you are a mechanical engineer, you are probably already familiar with the workings of this new and up-and-coming prime mover. Otherwise, you might be interested in a simplified run-down on how the turbine works.

Take a look at the schematic drawing, and note that the maximum pressure involved in the turbine is only 61 psi. This may come as a surprise to pipeliners who are accustomed to dealing with diesels which employ much higher pressures.

In a nutshell, a turbine is just this simple. Compress a sizable volume of air (with the axial flow compressor) to 61 psi; heat it to increase its volume and then expand it across the blading of the turbine. This is almost

the exact duplicate of a steam boiler, turbine arrangement. The boiler feed water is raised to the highest pressure on the system, the water is then heated to increase its volume (as steam) and then the steam is expanded across the blading of turbines.

The greatest advantage of the turbine lies in the elimination of stress reversals which are an integral part of a reciprocating engine. The push and pull of the latter, not only consumes energy, but creates most of the maintenance problems as well. Where all stresses are more or less constant, as in the turbine and in electric motors etc., maintenance is not a great factor.

All gas turbines consist of three basic components: an air compressor, a combustion chamber, and a turbine. Output is gained when air is drawn in and compressed, heated in the combustion chamber by burning a suitable fuel (in this case, natural gas, although successful tests have been made using fuel oil), and the resulting gases allowed to expand through the turbine section.

Axial compressor. In the Great Lakes' installation, a 13-stage compressor draws in 22 pounds of air per second (300 cubic feet) and forces it into the combustion chamber. Here the fuel is burned with the air, raising its temperature to above 1,300° F. and causing it to expand. This expanding air and gas flows first through the high pressure turbine which drives the compressor, and next through the low pressure turbine which, from energy remaining in the hot gases, drives the output shaft. The power turbine has a 6,400 revolutions per minute maximum and can be operated as low as 3,200 rpm, thus providing the operating flexibility pipeliners need for varying loads and speeds.

The 1,150-hp rating is based on an outside temperature of 80° F. at sea level pressure. But as the outside temperature goes down, the horsepower goes up, about 5 percent for each 10-degree drop. On one particularly cold morning, the turbine developed an actual horsepower of 1,500. This temperature factor works out well since the heaviest demands are in the fall and winter when large quantities of fuel oil are being moved. On the other hand, horsepower goes down as elevation increases, though it does not play as variable a role (about 3½ percent for each 1,000 feet).

The spare part inventory is small when compared to other types of prime movers; and in nine months (2,750 hours) of operation, maintenance requirements have been low. Light in weight (only 6 tons), needing only a small amount of auxiliary equipment (it's air cooled so no cooling water is required), the turbine has a lot in its favor.

Gas Turbine Operating Data

	Date	10-27-58
	Time	3:15PM
	Outside Air Temperature °F	61
	Barometer "Hg	29.48
Speed RPM	Compressor	11,050
	Turbine (Power)	5,600
Turbine Temperature	Compressor Inlet °F	61
	Compressor Outlet °F	
	Maximum °F	1245
	Interduct °F	1025
	Exhaust °F	905
Turbine Pressure	Casing Inlet "H_2O	-2.7
	Compressor Inlet "Hg	-1.3
	Compressor Outlet PSIG	36
	Exhaust "H_2O	+3.0
Fuel Pressure	Nat. Gas (Supply)	130
	Burner (Gas)	48
	Burner (Distillate)	
	Pilot (Gas)	5
Turbine Lube Oil	Pressure psi	22.5
	Temperature °F	115
	Vent (Turbine Base) H_2O	+.5
	Filter (Pres.) psi	52
M/L Pump	Suction psi	58
	Discharge psi	655
	BPH	2700
	API Gravity (Product)	(Y)42.3
	Oil Pressure psi	10
	Oil Temperature °F	106
	Hours Run	24
	Compressor Washed	10-27-58

Actual log of one day's operation of Great Lakes Pipe Line Company's gas turbine on its 12-inch Tulsa-Barnsdall line. The 2,700 barrels-per-hour figure is well below the unit's capacity, but was all the unit was called upon to pump that day.

To start the turbine the following sequence takes place:

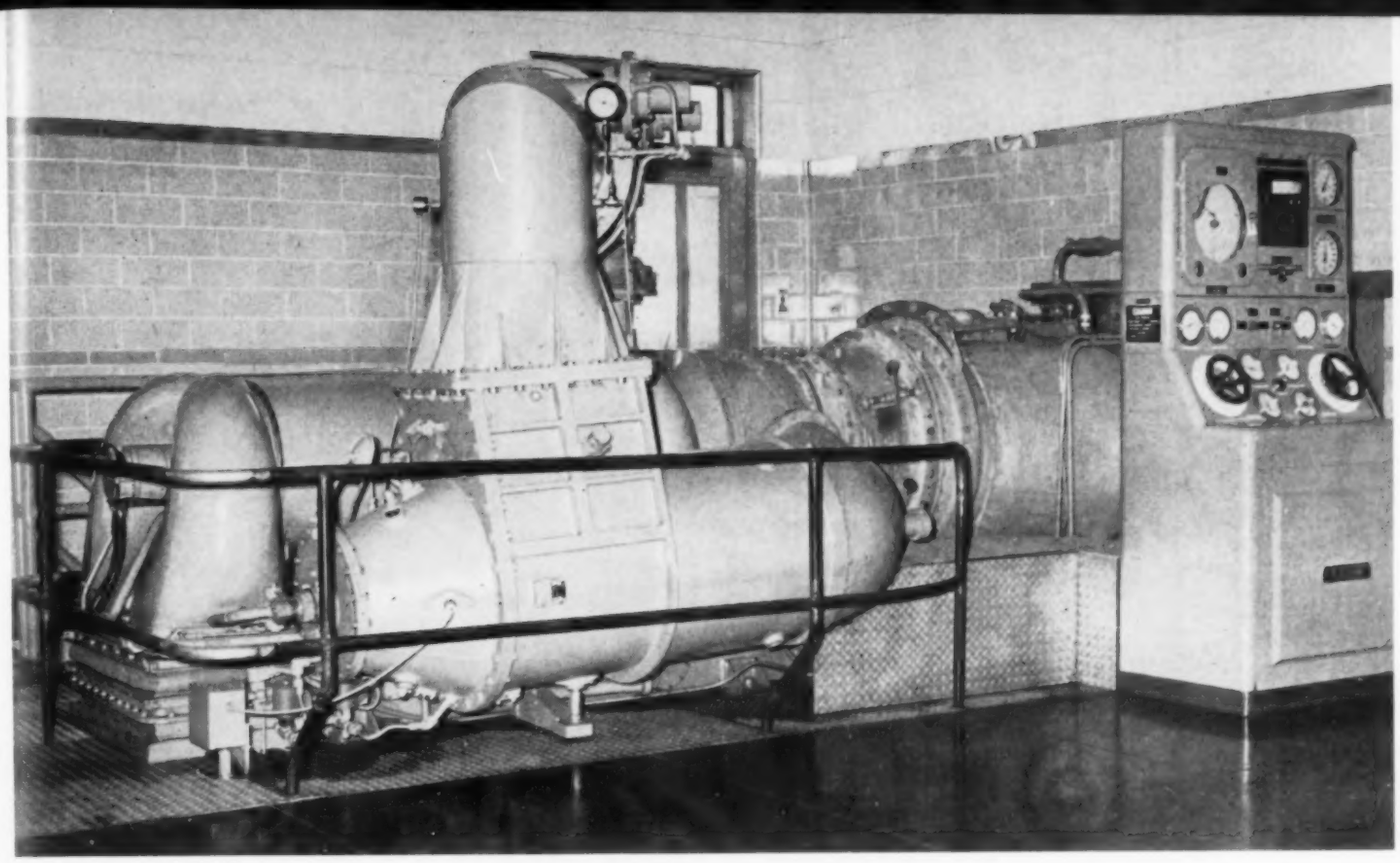
1. Start the auxiliary lube oil pump.
2. Then an electric motor starts the compressor and its turbine rotating.
3. The compressor speed is built up and the unit is cleared of any residue gas accumulating during the shutdown period.
4. A spark plug, like one in an automobile, ignites the main jet stream.
5. The compressor speed is built up to about 4,500 rpm by which time the main fuel supply is in the chamber and the compressor is self supporting.
6. The controls move to preset points and the power unit is running.

If the machine is started too fast, say in 20 seconds or so, overfueling results and the turbine will get too hot. Conversely, if more than 1½ minutes elapse before the turbine is self sustaining and the starting motor circuit broken, the startup batteries will become discharged.

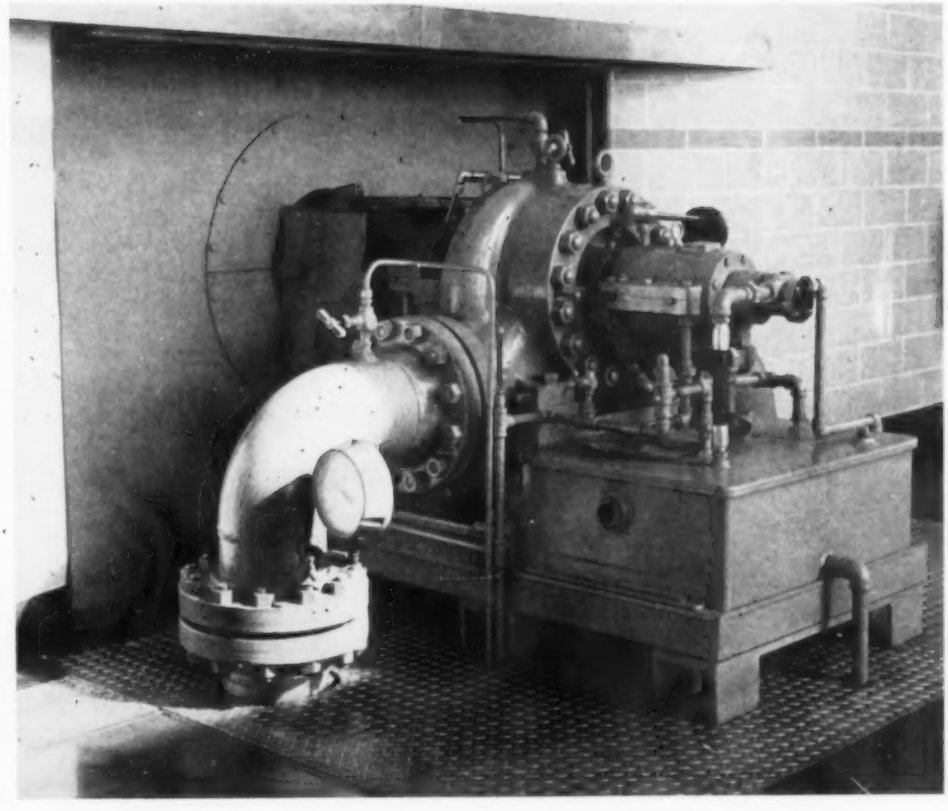
Early troubles. Originally the base structure developed objectionable resonant vibrations at high speed. This was corrected by stiffening the base with concrete. The critical speed of the shaft and coupling assembly between the pump and turbine was initially 5,400 rpm which was close to the desired operating range. A new shaft and coupling assembly was installed and the critical speed now is about 8,400 rpm.

Battery trouble. Several times, the startup battery was exhausted by the long cooling out time required after shutdown. During full load operation, temperatures are high (combustion above 1,340° F.; interduct temperature at 1,080° F.; and exhaust above 850° F.), making it necessary to pump lube oil through the bearings for as long as eight hours after shutdown to keep them from carbonizing. A separate auxiliary lube oil pump was installed to solve the problem.

The compressor blading must be kept clean. This requires large and



Great Lakes Pipe Line Company's gas turbine at West Tulsa, Okla. The 1,050-hp turbine weighs only six tons, which is about as much as an ordinary 800-hp diesel used in similar service. The small pump—it measures only 30 inches high—has delivered as much as 4,200 barrels of product per hour. Its design capacity is 3,950 bph.



expensive air filtering equipment. Once the unit failed to develop full power because of only a light deposit on the blades. Now a regular weekly washing schedule, which consists of injecting kerosine into the inlet air stream to the compressor, appears to have somewhat alleviated that problem. However, it is not entirely satisfactory, and the search for a better cleansing agent continues.

Economic Factors. The greatest disadvantage of the turbine is its low thermal efficiency of 16 percent, compared to about 34 percent for similarly rated diesels. **The cost of getting 1,000 horsepower, using natural gas as a fuel, has been about $3 per hour for the turbine. A diesel with dual fuel burning equipment can deliver 1,000 horsepower for $2 per hour and a straight diesel, $5 per hour.**

It is possible that a larger turbine (the Great Lakes' unit is small as turbines go) would be more economical than diesel or electric power at many points along the line. For example, at the locations where two 1,080-hp diesel units are required to move the product, one turbine may be able to do the job. If used on a larger line, say 16- or 20-inch, a turbine would probably do the job better.

Without an economical source of fuel, such as in Tulsa, it might not be practical to use a turbine. But when the thermal efficiency of those in the 1,000-hp class reaches 0.30 or so, other types of prime movers on products pipe lines may be displaced.

—**The End**

How Russians Saved 290,000 Rubles on River Crossing Job

Taking maximum advantage of ice on the river, crews greatly simplified the crossing problem

By A. J. Steiger, New York

PIPE LINE CONSTRUCTION crews in Russia find the thick river ice formed during the severe winters to be an able helper when laying pipe lines across wide rivers and water bodies that become ice-bound. For them, winter presented no insurmountable obstacle to pipe laying.

This is clear from a Russian report which gives a step-by-step account of how a pipe line about 28 inches in diameter and almost 600 yards long was laid across the Yenisei River at Krasnoyarsk in Siberia during the midst of winter at temperatures reaching 30 below zero.

Construction work was done from January to March when the Yenisei River ice is solid from bank to bank and strong enough to support the traffic of motor cars and horse-drawn vehicles that cross over on the winter ice road at points where ferries operate in summer.

The ice-bound river supported all the pipe line operations which included digging an underwater trench with draglines, welding pipe sections together into a river-wide span and lowering the welded line from the ice into the underwater trench.

The methods used in constructing the trans-Yenisei pipe line netted the Russian builders a saving of 290,000 rubles (1 ruble equals $0.25 at official rate), speeded up construction time and secured high-grade work in winter conditions, the Russian report stated.

Similar pipe line construction methods for winter conditions have been used in laying lines across the Volga, Neva, Moskva, Kama and Amur rivers and the Tatar Gulf, according to the report which appeared in *Novaya Teknika v Stroitel'stve* (New Methods in Construction), a Moscow trade journal in the construction field.

Technical Details of Yenisei Pipe Line. The line laid across the icy Yenisei was 720 mm O.D. (about 28 inches) with a 10 mm wall thickness. It was 540 meters long with twin branches on either bank.

The laying method was simple. The line was welded up on the ice, coated and lowered into the trench.

About 20,000 cubic meters of sand and gravel had to be removed from the river bed in the trenching operations. Because of the short work period—from January to March—construction crews abandoned the possibility of using the "Yo-Yo" technique in digging the ditch. Instead, draglines dumped buckets of spoil on the ice and bulldozers shoved it to shore.

Examination of the ice showed that it could support excavators with bucket capacity of 0.5 to 0.7 cubic meter. The trench was divided into three 200-meter sections with three excavators equipped with wedge-rammers 2.5 to 3 tons weight for loosening the ice and ground. Because the river was at lowest water level when air temperature was lowest, the river bottom's top layers near the banks (120 to 150 meters from water edge) were frozen to a depth of 1.5 meters. With rise of water level, the

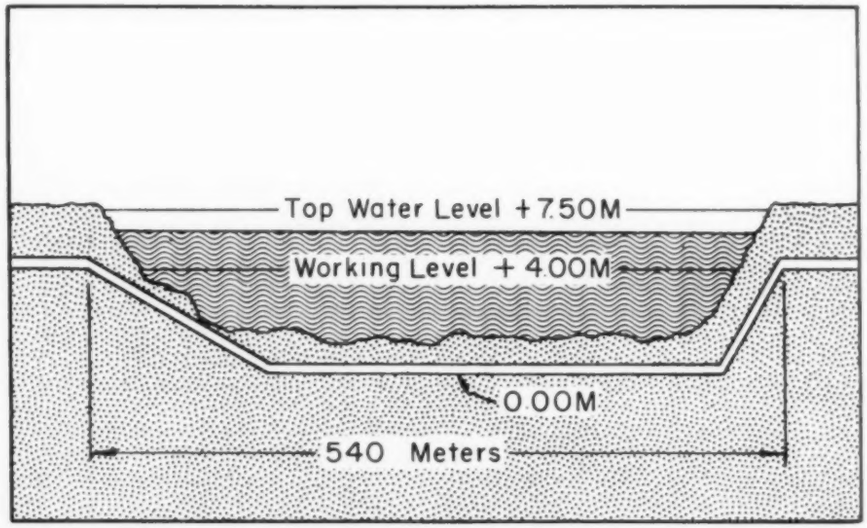


FIGURE 1—Elevation of river crossing beneath the Yenisei River at Krasnoyarsk in Siberia. First trench was cut in ice and ditch excavated. A total of 20,000 cubic meters of spoil was excavated by draglines and bulldozed to shore. Then line was welded up on the ice, launched in the water and sunk to the bottom of the ditch by filling line partially full of water.

submerged ground remained frozen.

Excavator productivity proved very low because the weight of the wedge-rammers was inadequate for loosening the frozen ground submerged 3 to 4 meters under water. Underwater explosions with small charges did not produce the necessary effect, while more powerful charges broke up the ice cover. For these reasons more powerful excavators with 1 to 1.5 cubic meter capacity buckets, equipped with wedge-rammers of 5 to 7 tons weight, were substituted for the smaller models.

In severe winter conditions at temperatures of minus 25 to 30° C., the excavator worked out 300 to 350 cubic meters of spoil per shift, digging 10 to 12 running meters of underwater trench. Following excavation, divers went down to examine the trench bottom and levelled off the foundation with hydraulic jets. The 10- to 12-meter lengths of pipe were delivered to the construction site, cleaned and coated on a special building slip. Here they were heated with hot air from inside. Coated pipes were hauled on sleds to the erection site where they were welded into sections 40 to 50 meters long. The welding was done by D.C. electric arc method; electrodes were heated in advance to 180 to 200° C. to secure reliable three-ply welded seam. Spare electrodes were stored on the job in a temporary oven and used as needed in replacement.

How the Russians Describe the Job. "The pipes delivered were untrimmed and not chamfered for welding; therefore, the ends were processed at the erection site with gas-flame cutter and electro-emery wheel. The butt welds were strengthened with an additional internal seam around the whole perimeter of the pipe. At each pipe joint 8 to 10 rhombic covers were welded in two layers.

"In erection and welding, the centering, butting and turning of the pipes was done with auto-cranes and a tractor by means of stoppers arranged so that pipes did not undergo intensified stress. The 40- to 50-meter sections were welded into three strings each 150 to 180 meters long. These three were in turn assembled into an over-all string, to the ends of which were welded the bank elbow branches. This work was the most demanding

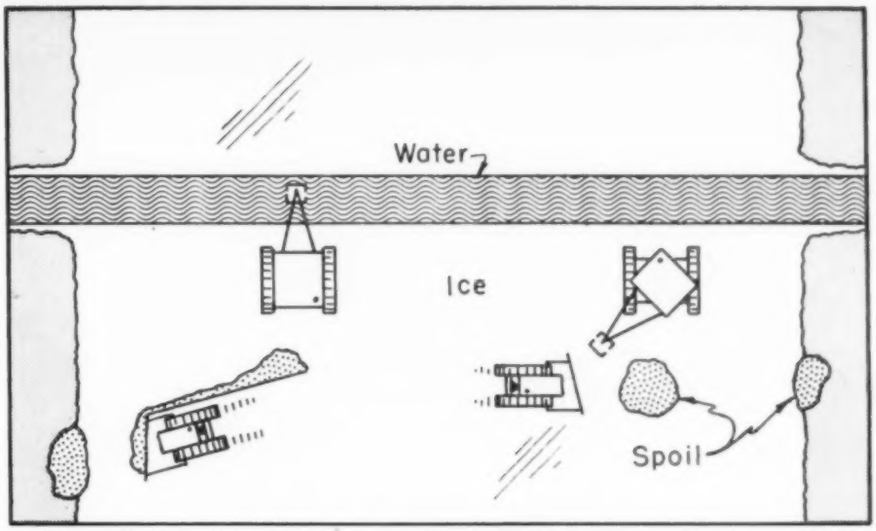


FIGURE 2—Excavating the ditch. Note that the bulldozer shoves spoil off the ice. The reason is simple. Total weight of the spoil was something like 50,000 tons:—enough to have broken ice.

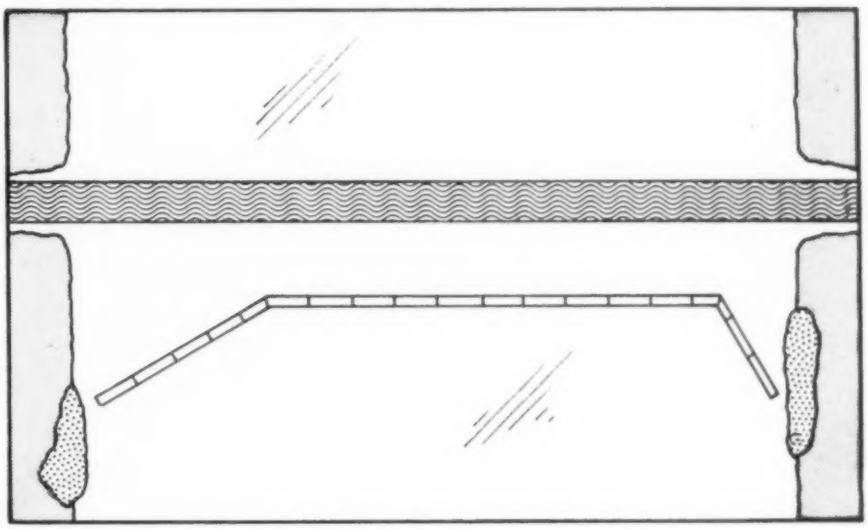


FIGURE 3—Pipe line crossing section was welded up on the ice and coated. Wooden lath corsets were wrapped around the pipe to protect the coating.

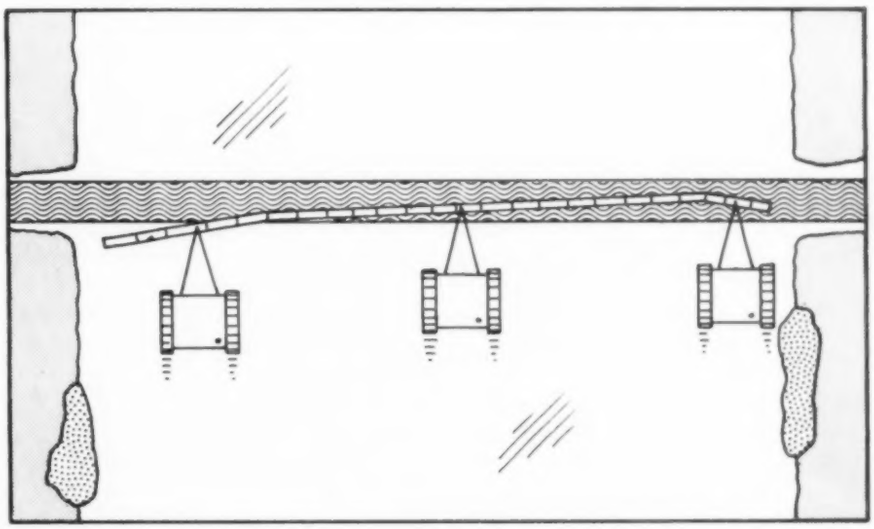


FIGURE 4—Pipe was snaked into the water and set aswim. The line was skidded across the ice, upended and worked into the water without damaging the coating.

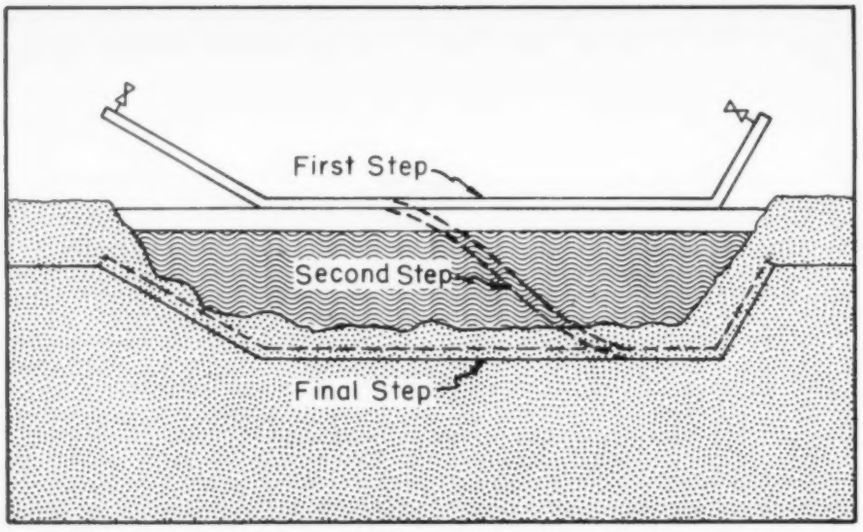
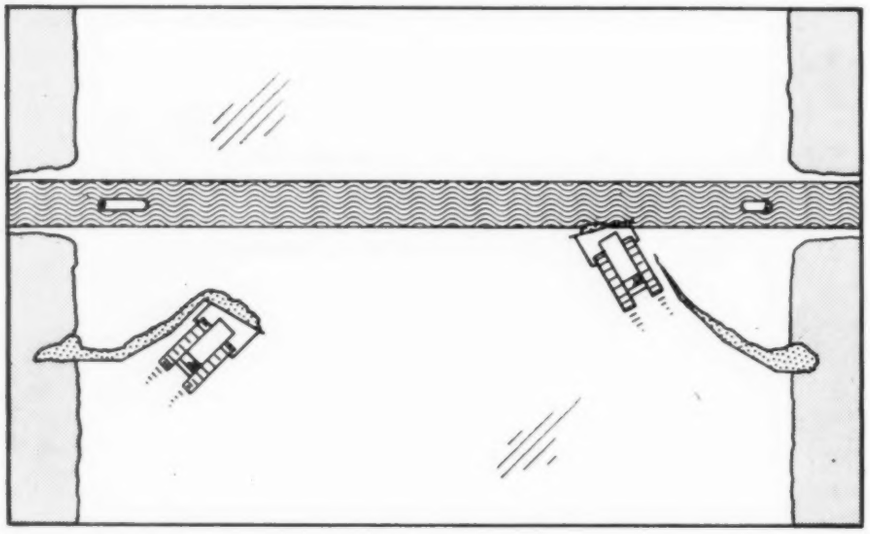


FIGURE 5—(above) How the pipe was sunk to the bottom. Water was admitted through the valve at right. The valve on the left was used to bleed air from the line to control flotation. Line was gently lowered to bottom.

FIGURE 6—(below) Once on bottom, the line was filled with water only to the depths not likely to freeze. The line was backfilled with tractors working across ice.



and difficult operation in the installation of underwater passages. When string and section joints were welded, the seam zone was heated to positive temperature by the flame of a benzene-oxygen cutter torch.

"The erection and preliminary testing of the pipe line was done on a building slip made of logs laid on the ice 6 to 8 meters apart.

"Before laying, the finished siphon welded to full length was pressed with air under 7 atmospheres pressure. All joints were tested for tightness by saponification with emulsion, after which an intensified insulation was applied to them. (*This means the section was pressured to 100 psi and welds were soap-tested.*)

"To protect the insulation coating, wooden laths 7.5 x 2.5 mm in section and 1 m long were put as bandages on the pipe line at points where it rested on the building slip and also where the stoppers were applied.

"Welding work on the siphon was done 10 meters away from the axis of the trench so as to prevent the ice from sagging under the weight of the mechanisms and pipe line. After being tested the siphon main was moved to the edge of the ice and lowered into the water, being set aswim in the trench axis by cranes of 10-ton capacity.

"The cranes were arranged at distances of 35 to 40 meters one from another (Figures 2, 3, 4 and 5).

"Two cranes hoisted a section of pipe line and then lowered it with booms, bearing it away outward. To prevent overstrain on the pipe line, the radius of bending both in plan and in vertical (not less than 600 m) permissible for pipe of the given diameter was strictly observed. In such a manner the siphon was, in the course of three hours, removed and set aswim in the axis of the trench."

Method of Pipe Laying in Underwater Trench. The method of lowering the line in the Yenisei River bottom trench is termed a means of "*free lowering through filling the pipe with water from one end*," but the Russian report said it was but one of several currently used to construct pipe lines in winter conditions. Choice of the method depends, the report said, on the state of the ice cover, depth to which the pipe line is lowered, rate of flow of river current, availability of technical equipment and so forth.

What is termed "the most widespread method" is to pull the pipe line across by cable along the river bottom. The finished pipe line is placed upon narrow gauge railway cars or on roller haulways on shore, a cable running to a windlass or traction engine on the opposite bank is attached to the pipe line and it is then pulled by the cable along the bottom of the trench to the other side of the river.

This method was used in construction of the natural gas pipe lines from Saratov to Moscow, Dashnev to Kiev to Bryansk to Moscow, in crossings over the Volga, Kama, Oka and other rivers.

Direct lowering of the pipe line from the river ice footing to the underwater trench is another method which was reportedly used in laying pipe lines across the Tatar Strait, the Amur, Volga, Neva, Moscow and other rivers. Under this method, the pipe line was lined up with the ditch lowered on guy ropes spaced 30 to 50 meters apart (depending on the pipe diameter and submersion depth) with simultaneous filling of the pipe with liquid.

When supporting guys or pontoons are not used, however, as in the method of "free lowering" employed on the Yenisei and other rivers, the Russian report said, "Great stresses arise in the pipe" and this method is considered applicable for pipe lines

with diameter upwards of 500 mm and only when the water body crossed has shallow depths.

"Estimates showed," the report continued, "that during laying of a pipe line 720/10 mm in diameter a depth of 4 m the stresses in the top fibres do not exceed 1,600 kg/cm² (about 545 lbs. sq. in.), i.e., are within permissible limits.

"Only with high-grade finishing of the welding work was it possible to lay the siphon by the indicated method. After testing the quality of the welded joints, the pipe line builders decided to lower the pipe to the trench bottom freely by filling it with water from a pump (Figure 6).

"From one end the pipe line was filled with water, and through an air nozzle of the opposite end the air displaced was escaped from the pipe. Lowering of the siphon took place smoothly, without jerks; which cannot always be achieved under other methods of laying underwater pipe lines. The position of the laid pipe was examined by divers. Measurements were also made of the pipe line marks.

"The underwater inspection showed that the siphon was laid in the planned position, strictly along the axis of the trench and did not sag anywhere.

"Because of the low air temperature, only the submerged part of the pipe was filled with water during lowering. Sections of the pipe that emerged above the water surface in the elbow branches were left unfilled to avoid formation of an ice cork in the pipe.

"When the air temperature rose above freezing, the siphon was completely filled and sheathed. A hydraulic test showed the pipe line to be completely airtight; pressure drop inside the siphon was not observed.

"In this same trench parallel to the pipe line an underwater power cable was laid for feeding the pumping station, and then with a tractor-powered bulldozer the trench was filled with the ground that had been removed earlier." —**The End**

Electrical Survey

Continued from Page 44

ways. To obtain the depth to bedrock, a series of resistance readings are made at various electrode spacings at a single station point. Referring to our example case and Figure 2, the resistivity value at Point 5 is of such magnitude as to warrant further investigation.

The set-up for an electrical sounding log is similar to the procedure given above except that the spacing between electrodes is varied symmetrically about the given point of Station 5. The first spacing between electrodes will be 3 feet. After a reading is taken, the electrodes are separated to an equidistant spacing of 6 feet, and so on for 9, 12 and 15 feet. At each spacing a reading is taken.

Depending upon the instrument used, the values will be either in ohms or mhos and representing the average resistance or conductance, respectively, for each successive depth. These values are tabulated as shown in Table 1 for the example case.

Because the readings obtained at the various depths are values for the full depth, some mathematical manipulation is required to obtain the average resistivity for each individual 3-foot layer. Referring to Table 1, it will be observed that Columns 1 and 2 contain the instrument reading of whichever type is used. Column 3 contains the differences in readings from one depth to the next in terms of the reciprocal of the average resistance. In other words, the second figure, 0.0339, is the difference between 0.0621 and 0.0960. The next step is to invert again by dividing unity with each of the values in Column 3. These new values now are in units of ohms as shown in Column 4 and represent the average resistance for each individual layer. By multiplying these figures by 191 times 3, the average resistivity value for each individual layer will be obtained—refer to general equation.

The next step is shown graphically in Figure 3. The layer resistivity values (ρ_L) are plotted as a bar graph. From experience it is known that resistivity values in excess of 300,000 ohm-cm usually indicates rock, and one glance at the bar graph will tell that rock is probably present at or near the 9-foot depth.

Although the examples given in this discussion are of a very simple type, the writer hastens to warn that some cases are more complicated. Best results will come after a background of experience has been obtained.

Fortunately complicated cases are few and far between, and the simplicity of operation coupled with the low cost of survey equipment (about $700) should make the method popular with many pipe line contractors. It should prove quite useful in solving some of the problems involved in pipe line ditching operations.

TABLE 1

Column	1	2	3	4	5
Depth	$\bar{R}$ Ohms	$1/\bar{R}$ Mhos	Diff.	R_L Ohms	P_L Ohm-cm.
3′	16.10	0.0621	0.0621	16.1	6,000
6′	10.42	0.0960	0.0339	29.5	11,000
9′	9.21	0.1087	0.0127	78.8	29,000
12′	9.13	0.1096	0.0009	1073.0	400,000
15′	9.06	0.1104	0.0008	1250.0	466,000

About the Author

Howard E. Barnes, consultant with the Engineering Research Institute, University of Michigan, has devoted more than 20 years to the study of soils in engineering and construction. A graduate of the Green Mountain College, Vermont and the University of Michigan, he has conducted soil research for highway, airfield, and general construction. These studies include both theoretical factors and practical field tests. His application of earth resistivity surveys to soil engineering provides a new tool to augment the results of pile load and bearing capacity tests and capillary potential studies in those fields. It may also prove valuable in pipe line construction. Barnes served in the U.S. Navy's Civil Engineer Corps during World War II. He is a registered professional engineer in Michigan and received a professional Civil Engineering degree in 1958.

ACKNOWLEDGMENT

The author expresses appreciation to Richard W. Inman, Associated Research, Inc., 3758 Belmont, Chicago, for supplying information instruments for this work.

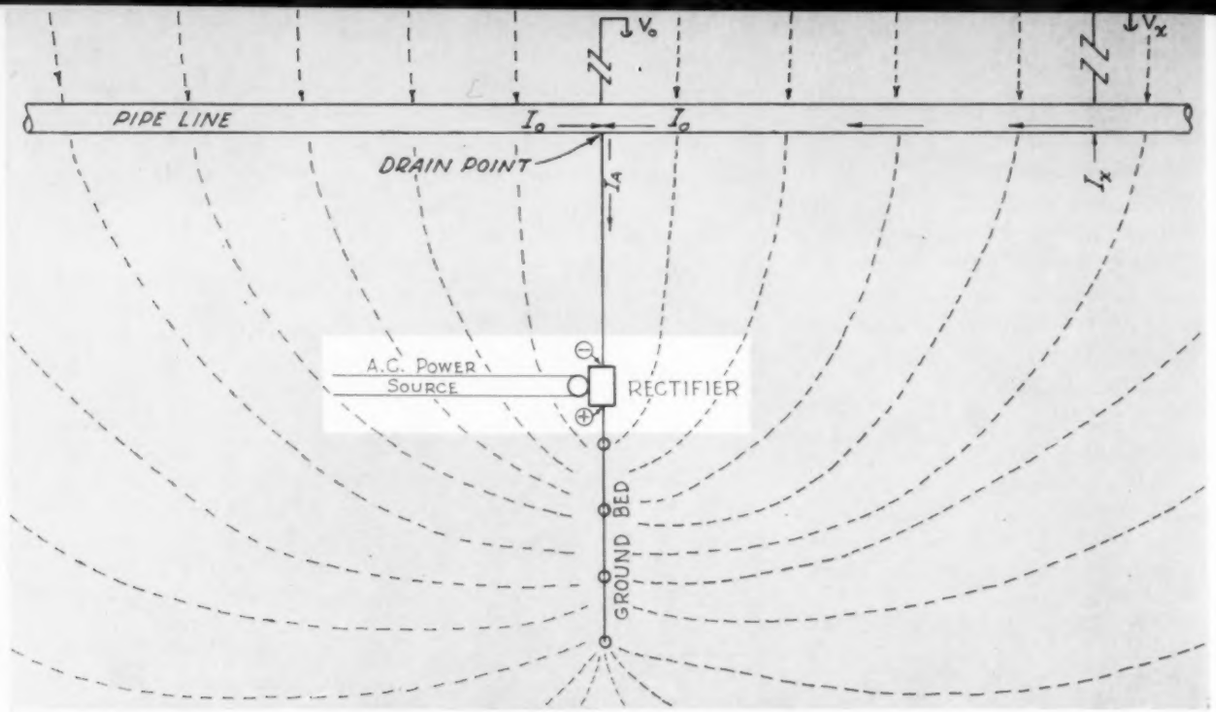


FIGURE 12—What is attenuation? Webster says it is a weakening or lessening of the force of . . . And that is just what happens in this cathodic protection system. If a DC source is installed at some location along a section of pipe line and sufficient current is impressed, the potential of the line can be shifted to a more negative (protected) value for some distance each way from the source. The potential change is greatest at the drain point (assuming the ground bed is properly located) and decreases, or attenuates, with increasing distance either way along the line. Attenuation equations enable design engineers to use limited data to predict effects of varying magnitudes of impressed current.

PART 2 – ATTENUATION FACTORS

How to Design Impressed Current Systems

These attenuation curves assume a uniform line of infinite length and a remote source of current. Such ideal conditions don't exist so here is the way systems are engineered practically

By James C. Bell, Engineer
Service Pipe Line Company, Tulsa

IN DERIVING the attenuation equations in Part 1 we assumed several theoretical conditions: (1) that the line is perfectly uniform throughout its length; (2) impressed current enters the ground at a point remote from the line; (3) the line is infinitely long. It's true that these conditions never exist, but this does not detract from the usefulness of the equations.

The practice of deriving theoretical relationships in this manner is common to all of the physical and chemical sciences. We must apply such relationships with good judgment and discretion, and use them sufficiently to determine their limits of applicability.

Word of Caution. Our experience with the practical application of attenuation theory is not sufficient to permit establishing limits of use. We can, however, point out some of the effects of departing from the theoretical conditions assumed.

The assumption of uniformity was required so that the "constants" α and R_k really be constant at all points along the line. However, these variables are functions of the longitudinal and leakage resistances of the line, so we would expect these latter quantities to vary for a given line.

Pipe Resistance Factors. Longitudinal resistance, R_s, varies with pipe size, weight, and chemical structure. Although this quantity is best determined by actual measurement in the field, it may be approximated as follows:

$$R_s = K/W \quad (17)$$

where K = pipe resistance constant per kilofoot
W = pipe weight, lb/ft.

Some average "K" values have been determined by Lyle R. Sheppard of Shell Pipe Line Corp. (unpublished) as follows:

Pipe Type	*K Value*
API Grade A-5L	0.227
ASTM Grade A-A106	0.227
API Grade B-5L	0.246
ASTM Grade B-A106	0.274
API High Strength-5LX52	0.293

For any given pipe size changes in R_s due to normal tolerances in pipe weight will have a negligible effect on the slope of the attenuation curve. Where wall thickness is changed for more or less pressure rating, a break would be expected in the attenuation curve; this effect is often overshadowed by other variables involved. From a practical stand point, normal changes in R_s for a given pipe size may usually be disregarded.

Variations in Leakage Resistance. Leakage resistance from pipe to ground, R_1, is the quantity most likely to vary considerably along a line, although the variance diminishes with improved quality of coating. R_1 is related in a rather complex fashion[4] to the leakage resistance of the coating, R_c and soil resistivity, ρ as follows:

$$R_1 = R_c + \frac{\rho}{\pi} \ln \left(\frac{1.12}{r\,\alpha} \right) \qquad (18)$$

where "ln" signifies the natural logarithm.

The symbol "r" denotes the equivalent conductor radius, which is obtained for pipe of diameter "D" buried at depth "h" by $r = (Dh)^{1/2}$.

R_c should not be confused with the resistance per unit area, or unit coating resistance, R_{ca}. R_c denotes the leakage resistance of the coating on a unit *length* of pipe and has the same dimensions as R_1. R_{ca} denotes the leakage resistance of the coating on a unit *area* of pipe and has dimensions such as ft^2-ohm or $(meter)^2$-ohm. Thus $R_c = R_{ca}/A$, where A denotes the area of the unit section; a particular quality of coating will produce different values of R_c for different pipe sizes.

As the leakage resistance of the coating increases, the second term of equation (18) becomes less significant, as illustrated in Figure 13. Thus the effect of varying soil resistivity becomes less pronounced as the quality of coating improves. The relationships which can be expected to hold for most practical pipe line applications are covered in Figure 13. So we see that a reasonably well-coated line approaches the conditions of uniformity required.

Remote Current Source Assumed. The requirement that the impressed current enter the ground at a point remote from the line is made to eliminate proximity effects which distort attenuation curves. When current is discharged from an anode, the earth potential is raised for some distance around. This results in a change in the electrical force impressed on a pipe line lying in the anode potential gradient.

The degree to which the attenuation of impressed current is influenced is a function of anode separation and quality of coating. For anode separations greater than 300 feet and reasonably good coatings, the effects will usually be negligible. However, the magnitude of the earth potential, which is included in the measured pipe potential, may be substantial. For the case of a single vertical anode, the potential gradient may be determined as follows:[5]

$$E_r = \frac{1.64\, I_a \rho}{\pi L} \ln \left(L + \frac{\sqrt{L^2 + r^2}}{r} \right) \qquad (19)$$

where E_r is the rise in earth potential, at the distance r from an anode of length L, caused by the current I_a discharging from the anode, and ρ is the soil resistivity. When r exceeds L by a factor of 10 or more, the equation resolves to, approximately,

$$E_r = \frac{0.522\, I_a \rho}{r} \qquad (20)$$

In these equations ρ is in meter-ohms; L and r are in feet.

Since it is usually impractical for us to exclude the effects of anode potential gradient, we simply recognize its existence, anticipate its effects, and then disregard it insofar as it affects the line under consideration. (These effects cannot, of course, be neglected where interference with foreign lines may occur.)

"Infinite Length" of Line. To derive the exponential equations (5), (6), and (7) we assumed the line to be of infinite length; we admitted this to be impossible. Practically, this requirement is approached as we move away from the terminals of *long* lines, as field data will verify. This assumption is required to eliminate termination effects.

When impressed current is drained from a point on a line near one, or both, terminals this current is no longer looking at a characteristic resistance on each side of the drain-point; terminal resistance is included. In this case current does not necessarily divide equally to both sides of the drain-point, the proration being governed by the magnitude of resistances in parallel, and V_o does not equal $I_o R_k$.

If the line condition and length are such that one terminal offers negligible effect, the current flowing to that side will be looking at a characteristic resistance and attenuation will become exponential a short distance from the drain-point. On the close terminal side, however, attenuation will deviate from the exponential mode due to the influence of the terminal resistance. To demonstrate the deviation which might be expected we have to return to the general equations and define some specific conditions.

Special Equations Derived. If the line terminates in an electrically "open" end such that the leakage current at the terminal is zero (as would be approached by an insulated flange) equation (2) becomes

$$V_o = I_o R_k \operatorname{ctnh} \alpha L \qquad (21)$$

where L is the distance from drain-point to terminal.

This function of V_o can be substituted in equations (1) and (2). However, less unwidely solutions for V_x and I_x result if the equations are expressed in terms of terminal conditions rather than origin conditions. Letting V_t and

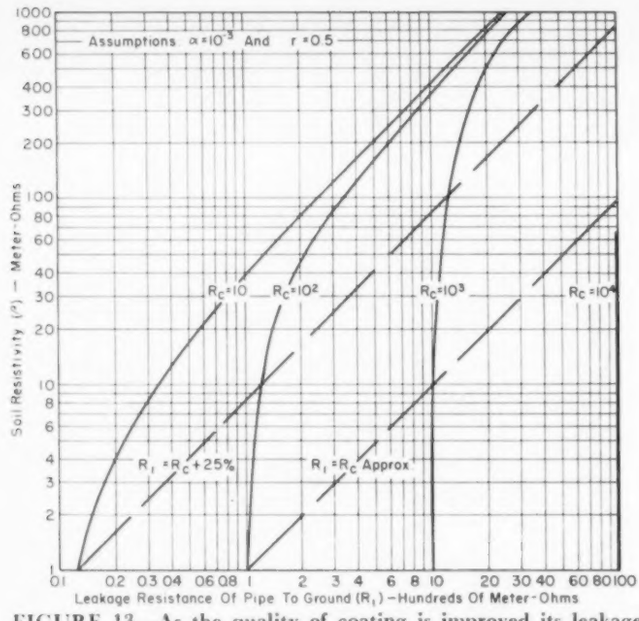


FIGURE 13—As the quality of coating is improved its leakage resistance increases so the effect of varying soil resistivity becomes less pronounced. The relationships shown here should hold for most practical pipe line applications. A reasonably well coated line approaches the conditions of uniformity assumed in attenuation calculations.

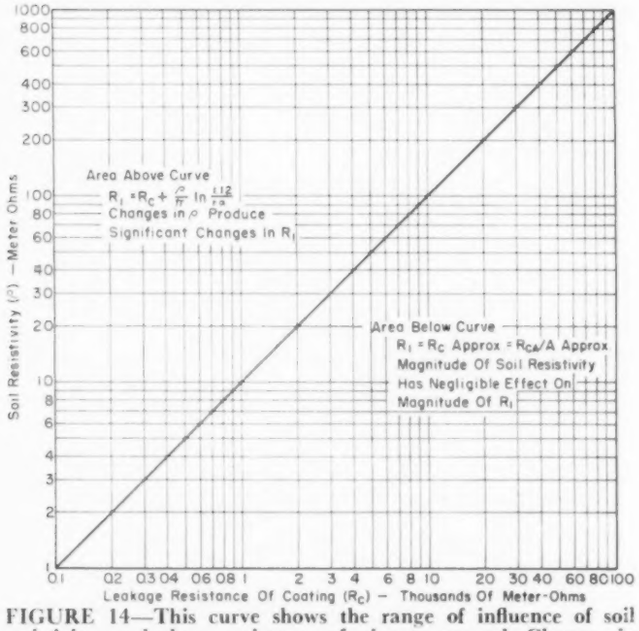

Area Above Curve
Rt=Rc+ρ/π ln t/ra
Changes in ρ Produce
Significant Changes In Rt
Area Below Curve
Rt=Rc Approx=RcA/A Approx
Magnitude Of Soil Resistivity
Has Negligible Effect On
Magnitude Of Rt
Soil Resistivity (ρ) — Meter Ohms
Leakage Resistance Of Coating (Rc) — Thousands Of Meter-Ohms

FIGURE 14—This curve shows the range of influence of soil resistivity on leakage resistance of pipe to ground. Changes in ρ produce significant changes in leakage resistance of pipe to ground in the area above the curve. Below the curve the magnitude of soil resistivity has less effect.

I_t be the impressed potential and current, respectively, at a terminal, it can be shown that

$$V_y = V_t \cosh \alpha y + I_t R_k \sinh \alpha y \quad (22)$$

$$I_y = I_t \cosh \alpha y + \frac{V_t}{R_k} \sinh \alpha y \quad (23)$$

where y is the distance from the point in question to the terminal. For the electrically open terminal these equations resolve to

$$V_y = V_t \cosh \alpha y \quad (24)$$

$$I_y = \frac{V_t}{R_k} \sinh \alpha y \quad (25)$$

From equations (24) and (25) we see that the attenuation curves for the case described are hyperbolic rather than exponential, as illustrated in Figure 15.

If the line terminates in a zero resistance such that the terminal potential remains unchanged while sustaining a significant impressed current (as would be approached by a massive bare ground) then

$$V_o = I_o R_k \tanh \alpha L \quad (26)$$

$$V_y = I_t R_k \sinh \alpha y \quad (27)$$

$$I_y = I_t \cosh \alpha y \quad (28)$$

On comparing these last two equations with equations (24) and (25) we see that the hyperbolic functions are simply reversed. Thus the shapes of the attenuation curves to a zero resistance terminal will be the reverse of those shown.

Practical Terminal Factors. In practice it is unlikely that we would find terminal conditions exactly as those described; an insulated flange usually has a path of leakage resistance from side to side. Even massive bare tankage exhibits some resistance to ground. Actual attenuation curves for a section of line influenced by a terminal will assume shapes somewhere between the exponential and the hyperbolic. Regardless of the shape of a known curve, curves for other drain currents can be constructed by proportion, as in the case of exponential attenuation. However, these curves apply only to the fixed length of L for the known curve.

Referring again to Figure 15 we see that the curves approach a straight line as the distance from the terminal increases. As the influence of the terminal resistance becomes less pronounced, attenuation tends toward the exponential mode. The resistance, R_t, looking from a drain-point toward a terminal may be expressed as follows:[6]

$$R_t = R_k \left(\frac{1 + U e^{-2\alpha L}}{1 - U e^{-2\alpha L}} \right) \quad (29)$$

$$\text{where } U = \frac{R_z - R_k}{R_z + R_k}$$

R_z is the terminal resistance and L is the distance to the terminal. This equation shows that R_t varies with distance from drain-point to terminal. As a consequence, the portion of the total impressed current flowing to the terminal side will vary accordingly.

Equation (29) is useful for determining terminal effects for any given set of conditions. From it, for example, we can estimate the area of influence of a terminal. For an electrically open terminal, R_z is infinite, U becomes equal to 1, and

$$R_t = R_k \left(\frac{1 + e^{-2\alpha L}}{1 - e^{-2\alpha L}} \right) \quad (30)$$

Attenuation Curve For Terminal Effects. By assigning values to α and plotting the ratio R_t/R_k versus L we

can obtain a family of curves, as in Figure 16. These curves show the distance at which R_t is essentially equal to R_k, one of the requirements for exponential attenuation; they thus define the area of influence of the terminal. For a zero resistance terminal equation (29) resolves to

$$R_t = R_k \left(\frac{1 - e^{-2\alpha L}}{1 + e^{-2\alpha L}} \right) \qquad (31)$$

and the same curves apply if the ordinate is made R_k/R_t.

Curves such as those shown on Figure 16 can be used for values of R_z between zero and infinity by virtue of the fact that $R_t / R_k = R_z / R_k$ at the terminal. Using the curve for the appropriate value of α, the point on the abscissa corresponding to an ordinate value of R_z/R_k is made zero, and subsequent abscissa values are changed accordingly.

Terminal Effects May Cover Many Miles. These curves show that terminal effects may extend many miles on a well-coated, large diameter line, but only a few thousand feet on a poorly-coated, small diameter line. It is important that we recognize the possible influence of terminal resistance, particularly in dealing with uninsulated terminals, when interpreting or setting up for field tests.

On long lines with insulated terminals, however, terminal effects may often be discounted. In this case system design can be based on data taken away from terminal influence; the resultant error near terminals will be toward over-protection rather than under-protection. If it is impractical to locate test drains sufficiently removed from a terminal, system design can usually be based on the exponential curve developed for the line side, rather than the terminal side, of the drain-point.

When Will "Paper" Design Work? Variables working against uniform attenuation of impressed current and potential along a given pipe line may give rise to considerable doubt about the possibility of a "paper" design for an impressed current system. The fact remains, however, that such designs have been and are being made successfully. We need only to determine by sufficient field testing if the line in question exhibits *reasonably* uniform characteristics and exercise good judgment in our use of attenuation theory.

Design of impressed current systems, or the whole business of corrosion control for that matter, is still somewhat more of an art than a science; it is doubtful that precise methods will evolve. Any "paper" design will require adjusting to field conditions such as availability of ground-bed locations and AC power (for rectifier units), extra capacity for alleviation of foreign crossing interference, and accessibility.

And changing conditions resulting from seasonal variations, coating degradation and long-term polarization will alter the attenuation characteristics with time. These factors must be considered in the final design, but our *first* problem is to determine the most *desirable* unit size and spacing. Attenuation theory is a tool which can be of considerable help in reaching this objective.

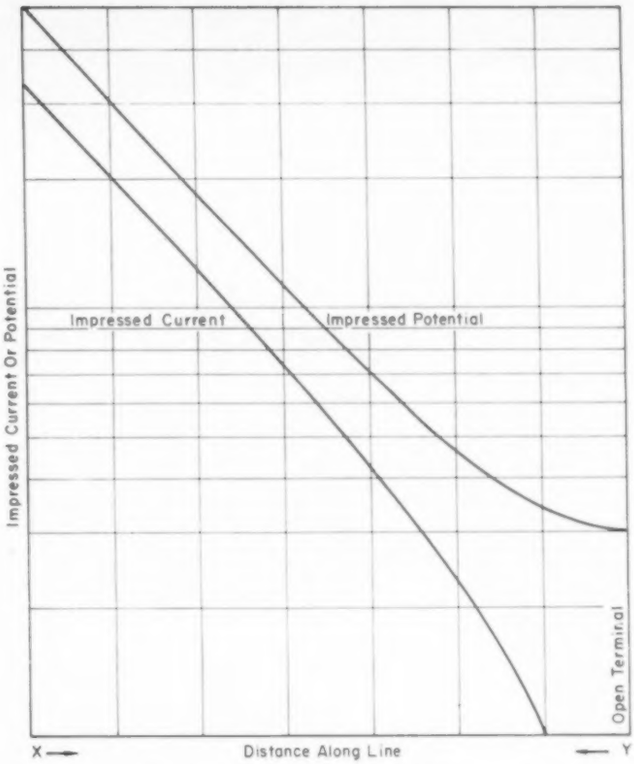


FIGURE 15—Plot of impressed current and impressed potential at increasing distances along the line show a hyperbolic attenuation curve toward an open terminal. For a zero resistance the shape of curves will be reversed.

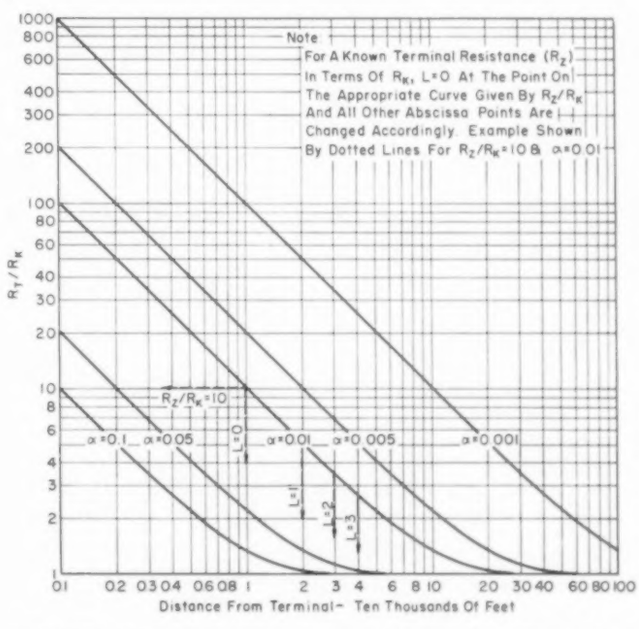


FIGURE 16—This family of curves shows the effects of an electrically "open" terminal on the resistance, (R_k) looking toward the terminal, (R_t) in terms of characteristic resistance. For a zero resistance terminal, the ordinate is R_k/R_t and the same curves are used.

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[2] M. E. Parker, "Pipe Line Corrosion and Cathodic Protection" p 27, Gulf Publishing Company, Houston, 1954.

[3] J. M. Standring, "Attenuation of Drainage Effects on a Long Uniform Structure with Distributed Drainage," *Corrosion*, June, 1947.

[4] E. D. Sunde, ibid., p 186.

[5] Robert Pope, "Attenuation of Forced Drainage Effects on Long Uniform Structures," *Corrosion*, Dec., 1946.

[6] E. D. Sunde, ibid., p 15.

The lead end of the pipe string and buoys break out of water as pipe line is successfully pulled into a slip cut to receive it during the crossing of the Intracoastal Canal near Crown Point, La.

Marine Methods Used To Lay Shell's Delta Line

Making pushes up to five miles, contractors averaged over 3,000 feet per day through Louisiana swamps and marshland

By Donald G. De Pugh
Construction Editor
PIPE LINE INDUSTRY

SOLVING MARSH problems with swamp buggies, boats and lay barges, Houston Contracting Company and Glaser Construction Company, Inc., employed submarine methods in laying over 90 percent of Shell Pipe Line Corporation's Delta crude line. Only one section of the line, an 8-mile stretch near Norco refinery, was laid by conventional land methods. The remainder of the line was constructed by the "push-pull" or flotation canal" methods.

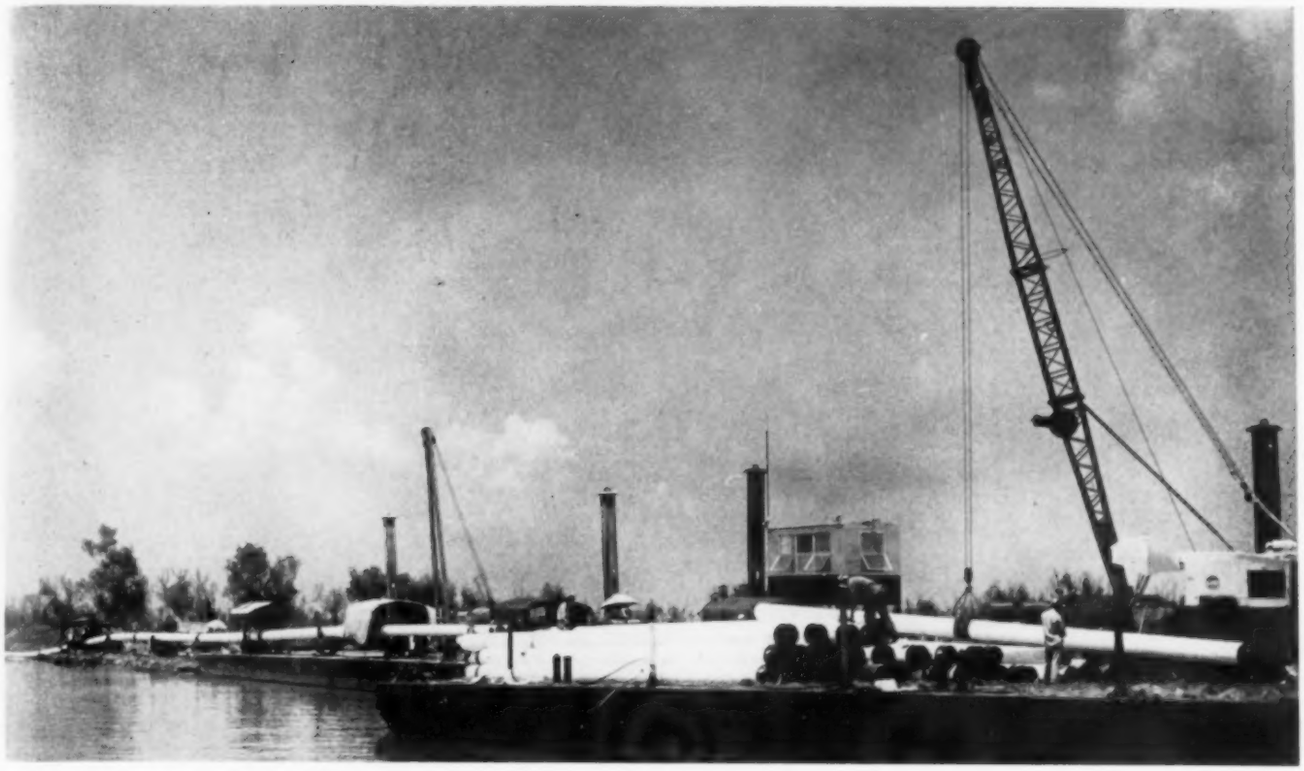
Extending from the Mississippi River delta area to Shell's refinery at Norco, the line was laid through approximately 118 miles of Louisiana swamps and marshland which prohibited tractors, trucks and workmen from using the right-of-way. With virtually no access roads to the right-of-way, engineers and inspectors had to make use of helicopters and seaplanes to reach construction sites.

The line consists of 66 miles of 20-inch from Nairn to Norco; 31 miles of 16-inch from Loutre Junction to Nairn; 9 miles of 12-inch from Southwest Pass to Loutre Junction, and 13 miles of 8-inch from Loutre Junction to the Shell Main Pass.

Five-Mile Push. In making the long pushes necessary on this line, swamp buggies were used to pull the pipe as it was pushed from the barge. A radio link between barge and buggy enabled operators to synchronize their operations. Several pushes over four miles long were made; the longest single push measured five miles.

Minimum ditch widths used in the push-pull method were 18 inches for 6-inch and 8-inch, 28 inches for 12-inch, 30 inches for 16-inch, and 36 inches for 20-inch pipe. Minimum cover on all the line except the 12-inch portion was 36 inches. On the Southwest pass 12-inch lateral the line was laid to a minimum cover of 12 inches meeting government requirements. Flotation canal width was 36 feet and minimum depth was 5 feet. The canal ditch was dug deep enough so that the pipe would be a minimum of 12 inches below the canal bottom.

Asphalt-Mastic Coating. To make sure that the pipe would stay buried in the marsh, Shell engineers specified conventional asphalt mastic coat-



A shove is made off the lay barge on Glaser Construction Company spread at Cubits Gap. Yard coated pipe is stacked on the supply barge, right, and is moved to the lay barge where it is welded and X-rayed before field joints are coated.

ing for over 100 miles of the line with an added jacket of concrete for river and canal crossings.

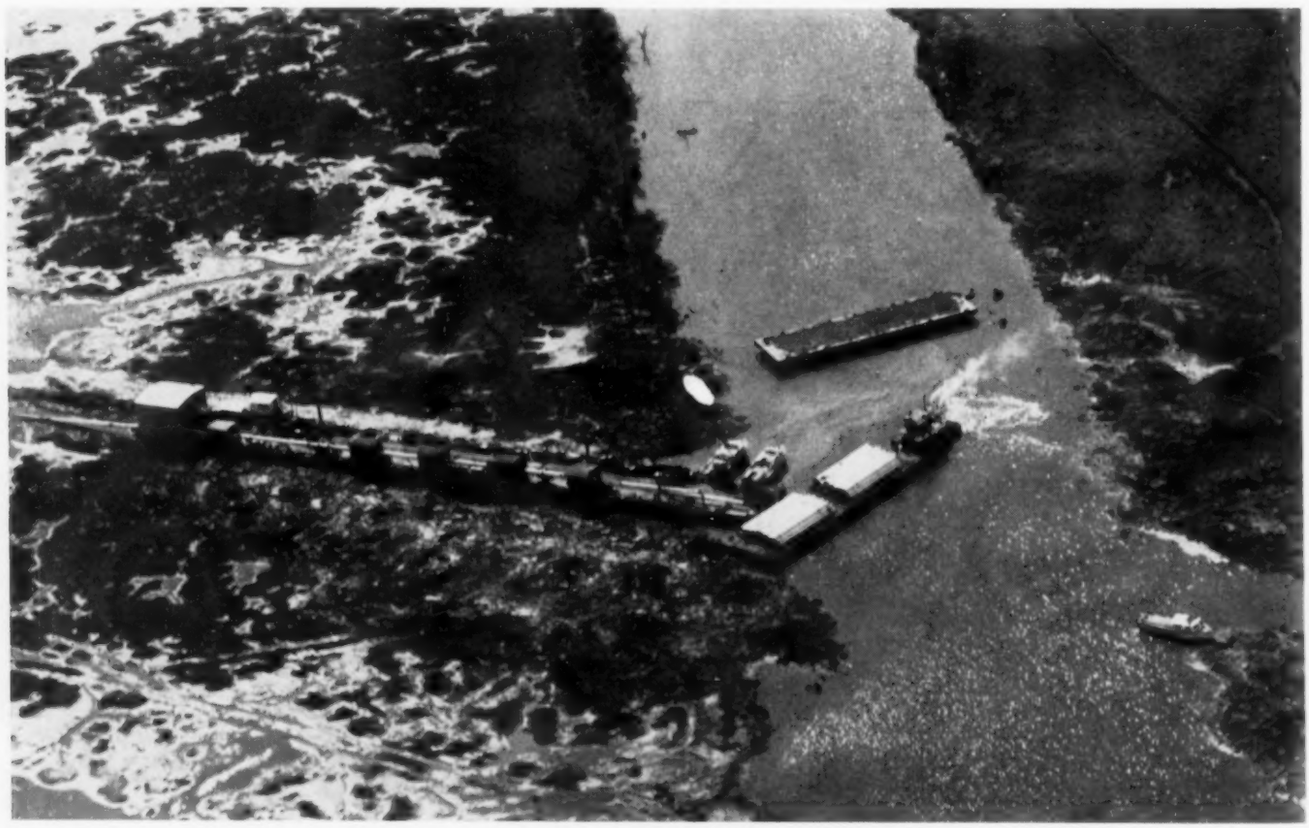
Trenching through the marsh was done with a dragline mounted on the rear of a marsh buggy. After ditching was completed, a lay barge moved as close as possible to the end of the ditch. On the barge, pipe was welded, X-rayed and joints were field coated using a specially designed form. As the pipe was pushed off the barge, marsh buggies hooked onto the pipe to pull it upstream. On good days, contractors made up to 4,000 feet. The entire line was completed in a six month period.

With the exception of the 8-inch lateral to the Main Pass station, the line was coated with asphalt-mastic at H. C. Price Company's Harvey, La., yard. A double coating of $^{2}/_{32}$-inch asphalt enamel was applied on 3 miles of 8-inch pipe; the remainder of the 8-inch received a double application of $^{2}/_{32}$-inch semi-plasticized coal tar. Pipe consisted of API Grade XLX 42 and 52; wall thicknesses ranged from 0.250 to 0.500 inch.

After field joint coating has been applied on the lay barge, water is sprayed on the form to cure the asphalt mastic coating before removing the form. After the joint coating is completed, the pipe is shoved into the ditch.

River Crossings. The Delta line crosses the Mississippi River at two

Aerial view showing marsh buggy along each side of ditch used in pulling pipe into ditch from lay barge some four miles away. Their operation with the barge is synchronized by radio. Longest single shove in construction of the line was five miles.



A supply barge is moved into position by a river boat as the push across Wilkenson Canal near Myrtle Grove, La. is made. In addition to small canal and bayou crossings, the Delta line crosses the Mississippi at Nairn and Destrehan.

locations, the South Pass, Pass a Loutre and Cubits Gap once. J. Ray McDermott & Co., laid the dual 20-inch crossing at Destrehan and the dual 16-inch crossing at Nairn. Both crossings were laid on the existing river bottom; river banks were dredged, excavated and backfilled.

Station Construction. Station construction in the swampy delta area presented another problem to contractors. The Shell Main Pass and California Main Pass stations were constructed on reinforced concrete

The lay barge equipped with four welding stations and coating station pushes pipe into ditch toward Loutre Junction. Contractors averaged over 3,000 feet per day in laying the 118-mile line from Mississippi River delta area to the Norco terminal. Construction was completed in six months.

slabs, elevated 10 feet above mean Gulf level, and supported by precast concrete piles. At Southwest Pass the slab is 12 feet above mean Gulf level. The Pilottown reinforced concrete slab, located 5 feet, 4 inches above Gulf level, is supported by composite wood and concrete piles.

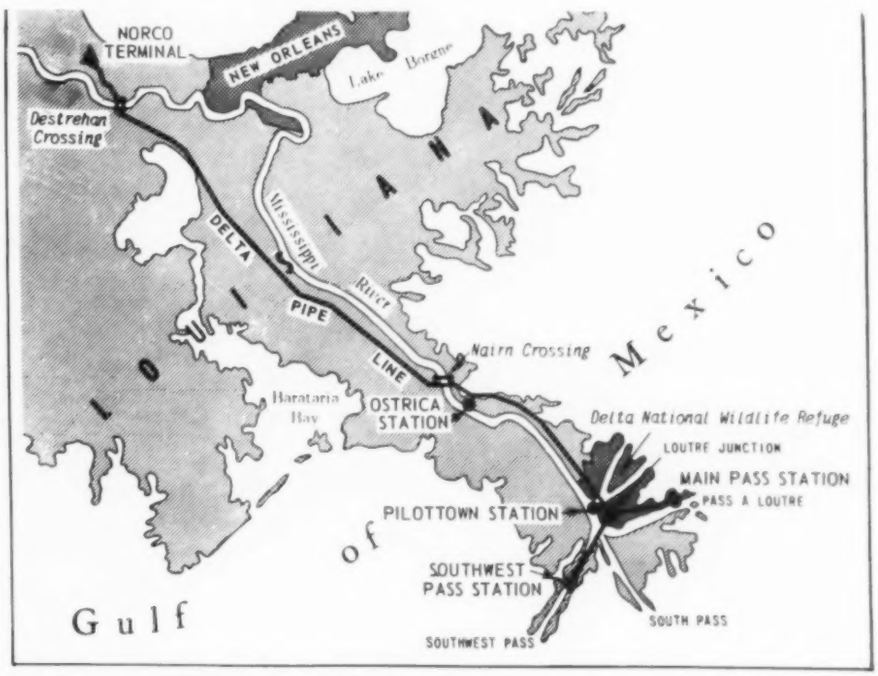
The system is designed for an initial delivery of 90,000 barrels of crude daily with an ultimate capacity of 160,000. Delta Engineering Corporation installed pump stations at Southwest Pass and Main Pass, with feeder stations constructed at the California terminal, Ostrica terminal and Pilottown terminal. The 1,600 horsepower station at Southwest Pass includes three double volute, single stage, double suction, horizontal split case centrifugal pumps driven by 6-cylinder gas engines and two gas driven booster pumps. At Main Pass there are two six-stage, staggered volute, opposed single suction impellers, horizontal, split case centrifugal gas driven pumps plus two gas-driven boosters totaling 960 horsepower.

Two two-stage vertical type centrifugal gas driven booster pumps rated at 42 horsepower were installed at California terminal. One horizontal duplex piston power pump driven by a diesel engine with a 138 horsepower capacity is located at Pilottown, and the booster pump at Ostrica is an electric-driven vane-type rotary pump.

Communications. A microwave system providing telephone and teletype circuits between Southwest Pass, Main Pass, Norco terminal and offices in New Orleans was constructed by Radio Corporation of America. Installation of microwave towers was by Tower Construction Company. The system includes teletype machines at the above locations.

The line passes through a section of the Delta Wildlife Refuge as well as oyster-breeding and muskrat trapping areas which caused problems for the right-of-way crews. Through the wildlife refuge, helicopters were used to pull skiffs through marsh; it was feared that marsh buggies would disturb nesting birds. Construction on this section had to be completed by October 15 to assure a peaceful setting for ducks and geese that make this their winter home. The line was routed to avoid, as much as possible, the oyster leases and muskrat areas.

—The End



Shell Pipe Line Corporation's $11.5 million Delta crude line originates near the mouth of the Mississippi River and extends 118 miles to the Norco terminal. Approximately 90 percent of the line was laid through marsh and swamps. Pump stations were installed at Southwest Pass and Main Pass with boosters at Ostrica, Pilottown and California terminals.

Time-Saving Books For Busy Pipe Line Men

PIPE LINE CORROSION AND CATHODIC PROTECTION
A Field Manual
By Marshall E. Parker

This book is designed as a practical field manual. It provides workable methods that can save you valuable time and effort in obtaining interpretive field data.

CONTENTS (Condensed). Soil Resistivity Surveys: Soil resistivity units, two- and four-terminal resistivity determination, locating "hot spots" on bare lines. Pipe-to-Soil Potentials: Electrodes, voltmeters, slide-wire potentiometers, potentiometer-voltmeter, vacuum-tube voltmeter, electrode placement, surface potential, survey for corrosion. Line currents: calibration of test section, stray current studies, cathodic protection tests. Current Requirement Surveys: Principles of current measurement test, field procedure, temporary ground beds. Rectifier System for Coated Lines: design principles, attenuation curves, design procedure, the economic balance. Ground Bed Design and Installation: disturbing factors, field modification, installation methods. Magnesium Anodes on Coated Lines: when and where to use magnesium anodes, general design system, installation procedure, polarization and final adjustment. Hot Spot Detection: locating hot spots, anode selection and spacing, installation, supervision and control. Stray Current Electrolysis: detection of stray current, remedial measures. Interference in Cathodic Protection: design, crossing bonds, auxiliary drainage. Operation and Maintenance: failures in rectifier-ground bed and magnesium anode systems, monitor systems. Coating Inspection and Testing: construction detection, when and how to "jeep," evaluation of coating in place. Appendix: Fundamentals of Underground Corrosion, Basic Principles of Cathodic Protection, Tables and Properties of Metals, Attenuation Equations. Index.

1954, 108 pages, illustrated.....Price $3.00

CORROSION: CAUSES AND PREVENTION
By Frank N. Speller

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By Pipe Line Pete

IDEAS FOR THE FUTURE!

. . . in pipe line engineering, construction and operations

They're Getting Ready to Mine the Bottom of the Sea!

One of the most important results of the recent International Geophysical Year was the discovery of new wonders in the sea! As a result, sea scientists are predicting that ultimately our oceans will produce more bountiful crops than the land; and meanwhile there are rich mineral deposits that only need picking up!

In fact, scientists have mapped out 14 million acres of ocean bottom that contain an abundant treasure-trove of manganese, cobalt, copper and nickel. The extent of this vast "mine" is staggering to the imagination. There are approximately 200 billion tons of rock-like nodules lying in areas on the ocean bottom, varying in size, from a fraction of an inch to five feet in diameter.

Mining the sea in one sense is not new. Dow Chemical Company has been separating magesium from sea water for years. However, companies that go after the new deposits will have only to hoist the nodules on board, transport them to land and smelt them.

In terms of reserves, these new discoveries promise us an ample world supply of minerals for years to come.

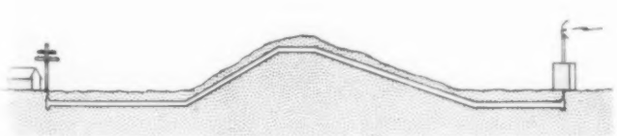
New Ceramic Catalyst Converts Gas Flame into Infra Red

Some manufacturing plants in Canada are almost too big to heat in the winter. Northern Ontario Natural Gas Co. engineers found that forced-air systems suffered greatly in the high-ceilinged mills served by the company.

But there is a solution. By using heating units that employ a newly-developed ceramic catalyst material that converts the heat given off by gas flames into infra red rays, the size of the enclosure isn't important. These rays heat solid materials, but not the air—directly. They warm the floor, the walls and the occupants of a room. The air is heated indirectly.

Wave Guide to Be Pipelined?

A two-inch piece of pipe with a highly polished interior can perform fantastic feats in the field of communications. It will carry more than 10,000 two-way telephone conversations along with 100 TV programs! By way of comparison our modern-day co-axial cables with eight tubes will carry about 10 percent of this amount.



This pipe is in reality a radio wave guide and it definitely has a place in your future communications. Originally it was effective only if it were laid perfectly straight. But scientists in Bell laboratories have come up with a pipe made of coiled copper wire with a flexible outer coating, which will direct the waves around sharp bends.

One of the most exciting aspects of the new wave guide is its unprecedented range. At present, the Federal

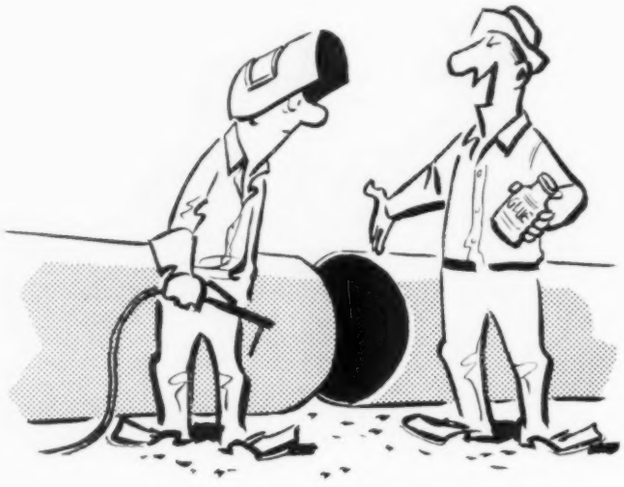
Communications Commission recognizes frequency ranges up to 30,000 megacycles. Beyond this frequency, attenuation, or loss, is too great to be practical.

Just the opposite is true of the wave guide. The higher the frequency, the less the loss! Moreover, the guide will handle frequencies all the way up to 50,000 megacycles!

According to rumors, laboratory technicians are producing a version of the wave guide no larger than a fountain pen. This will likely be used for distribution inside cities etc. Another rumor has it that construction of a north-south wave guide in the central United States is not too far off. This should make for some interesting pipelining.

Super Glue Sticks Steel, Bones, Glass

Fantastic things are being accomplished with glue. In Baytown, Texas, one company is operating a diesel engine which was broken into four pieces and glued back together! According to the latest reports the engine has logged seven months of trouble-free service.



But the newest thing in the stickum line is a chemical adhesive that glues rubber, enamel or plastic to glass. In the missile program it is now being used for binding rubber to steel. When it glues two metals together, its efficiency is such that only extreme heat can break the bond.

This new product was developed by Eastman Chemical Products, Inc., a subsidiary of Eastman Kodak Company. Chemically it is Methyl 2-Cyano Acrylate. However, the company simply designates it Eastman 910 adhesive.

The developers are downright optimistic in predicting its widespread success. They envision the time it will be used for gluing houses together—replacing nails and bolts—and they point out that the product would be excellent for sticking desks and furniture together. They predict that eventually it could be used in surgery to repair broken bones, etc.

Armstrong Cork Company will handle small retail sales of the new product, which will sell for about $10 per ounce. While this is high, there are many drops in an ounce, and it takes only a drop here and there to hold a sizable structure together.

New Engine Grout—Five Times Stronger, Chemically Inert!

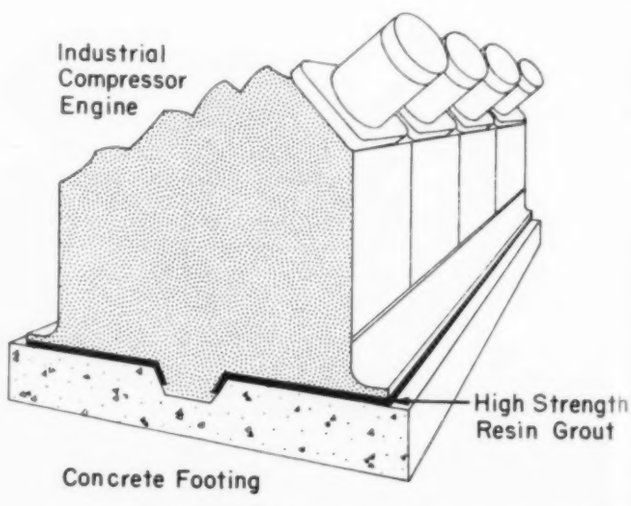
One of the vexing problems for pipeliners has often been the poor quality of engine grout made from ordinary cement, sand and water. Contaminated with oil, it will not set properly; moreover, it shrinks when it sets and oil spillage can cause it to deteriorate.

A new high-strength, chemical resistant grout has been developed by the Ceilcote Company especially for grouting machinery where vibration and other operating conditions are unusually severe.

Important physical properties include a tensile strength of 1,950 psi, a compression strength of 15,000 psi (nearly five times that of concrete), and a bond to steel of about 1,000 psi! In addition, it has great impact strength and abrasion resistance, no shrinkage, imperviousness to oils and low moisture absorption.

The importance of the low shrinkage cannot be overstressed. Cement grout shrinks in proportion to its water content and its cement content. If such grout is 6 inches thick in one place, 1 inch in another, the amount of shrinkage will vary at a ratio of 6-to-1, unless iron filings etc. are added to the mixture. This could mean that once the shims have been removed, the engine could be out of line.

This new grout is made from a modified resin, inert fillers and special hardeners. It is possible to pour it in depths up to 6 inches at one time, and after 24 hours small equipment can commence operations; after 48 hours, it is safe for large pieces of machinery to start up.



John Graham, administrative assistant in the executive department, explains the work simplification program to Service Pipe Line Company executives.

'Work Simplification' at Work

Here's how Service Pipe Line Company applied the idea of "working smarter . . . not harder" . . . and came up with 90 ideas that resulted in saving of 25,000 man-hours and $162,294 the first year

ASK CONSULTANT A. H. MOGENSEN to define work simplification (which is his business) and he'll say, "It's the organized use of common sense!"

If this sounds too general to be interesting to you, just take a look at some of the things pipeliners with Service Pipe Line Company have been accomplishing under his guidance.

1. The company issued credit cards for each company vehicle and saved 2,000 man-hours a year by eliminating paper work in the Tulsa office.

2. A new system of field purchase orders is saving 3,700 man-hours per year, and

3. By adopting a simple method of handling returnable containers—Cable reels, oxygen bottles, etc., the company is saving about 700 man-hours yearly.

These and nearly 90 other improvement ideas have been developed by Service Pipe Line Co. personnel through a work simplification program supervised by Mogensen. He accomplished this mainly by encouraging the pipeliners to adopt a questioning attitude, taking a critical look at themselves and the work they do and applying their basic ingenuity to the problems at hand.

The objective is to make their own jobs easier; to find a way to "work smarter—not harder."

How the Program Was Started. The program Mogensen developed for Service is anything but the old "efficiency expert" plan, which usually was based on one man's opinion of jobs he didn't understand. Instead it is based on "the organized use of common sense on the part of everyone involved—to find easier and better ways of doing work."

The key words are "organized" and "everyone." Service started the program off by selecting three persons to take initial training in Work Simplification. Two took an intensive course under Mogensen and his staff; and the third attended a course in paper work simplification under Ben Graham, another well-known authority on methods improvement. It then became their job to explain the philosophy and methods of Work Simplification to the others at Service.

They began by outlining the program to a pilot group in a series of sessions lasting a total of 20 hours. This group not only learned the basic elements of the program but helped

How the Work Simplification Program Paid Off

90 Job Improvements

During 1958, Service Pipe Line Company's Work Simplification resulted in 90 ideas for job improvements. This is the result of a concerted effort on the part of a company-wide program.

TOTAL ANNUAL SAVINGS

Total Improvements	Man-Hours		Dollars
	Tulsa	Field	
90	13,820	11,362	$162,294

Company Forms

1. Revised Form 44, Purchase Order, and Form 250, Partial Receipt Copy, to include analysis box. Reduced use of Form 331, Voucher Distribution Sheet, by 95 percent in Tulsa.

2. Revised Form 355, Run Ticket Summary, to eliminate need for Form 332, Lease Ledger, except for shippers other than IOPCo.

3. Eliminated summary section of Form 129, Field Time Sheet.

4. Revised Form X-141, Monthly Work Analysis.

5. Eliminated Form 200, Report of Idle Installed Facilities.

6. Form 327, Statement of Sickness or Injury, required only when excludable income will be paid during absence.

7. Canceled Form X-78, Distribution of Hours Worked.

8. Consolidated monthly pipe reports, Forms 99 and 194.

9. Discontinued Form 0-42, Monthly Overtime Report.

10. Discontinued Form 0-4, Cost Supplement to Leak Report.

11. Revised Form 367, Report of Lines Filled or Drained, to allow preparation of only one report for both lines filled and lines drained.

12. Revised routing of division copy Form 271, Cathodic Protection Unit Report, to send direct from originator to Corrosion Technician, in Wyoming Division.

Methods and Procedures

1. Improved procedure for checking extensions on Form 60, Gas, Oil, Grease, and Tire Repair Order, in Tulsa. (Installed prior to use of credit cards.)

2. Credit card system of making gas, oil, grease and tire repair payments replaced use of Form 60, Gas, Oil, Grease and Tire Repair Order.

3. More expendable material items to be charged to operating expense.

4. Eliminated "comping" of Field Purchase Orders after extensive check revealed few errors and these of small consequence.

5. Replaced hand dating and initialing of work by comptometer operators with pencil stamp.

6. Simplified calculation of delivery and transit receipts.

7. Revision of tender accounting.

8. Unification of records for five Missouri warehouses into only one set.

9. Discontinued monthly posting in Accounting department of cost items on card index for fittings and miscellaneous materials.

10. Eliminated making of material transfers and container notices on both oxygen and acetylene containers. Field maintains records locally as necessary.

11. Eliminated record transfers and container notices on cable and wire reels. Cost of reels absorbed in cost of wire or cable.

12. Eliminated double check on expense code location on reports of first runs.

13. Simplified procedure in Accounting for payment of taxes.

14. Substituted mimeo stencil in Authorizations department for typed carbons of memoranda for Operating Conference.

15. Reduced number of copies of authorizations prepared and distributed.

16. New tracer system used by Authorizations department in connection with routing of requests for authorizations.

17. Shifted handling of Texas Railroad Commission Form 113 to Authorizations department which keeps required data. Eliminated double handling of information and centered control in one office.

18. Placed responsibility for renewal and termination of power and gas contracts in field, thus eliminating preparation in Right-of-Way department and circulating approval memorandum through Tulsa Offices.

19. Deleted approval of Assistant Comptroller on refund application under Education Assistance Program.

20. Revised procedure for issuing fiber gaskets eliminating use of shop order for that purpose.

21. Discontinued Form X-22 and old procedure in reporting personnel changes for telephone directory. New forms are now provided in each telephone book.

22. Combined individual periodical subscription renewals into single annual over-all renewal and payment for each publisher.

23. Discontinued "on-line" runs.

24. Revised procedure in reporting overruns, state of Texas.

25. Revised handling of claims by producers for lost oil.

26. Improved procedure for assigning "S" numbers to field vehicles.

27. Improved procedure for returning photostated mobile equipment titles and other papers to field offices.

28. Assigned Policy Manuals to classifications instead of individuals. Eliminated keeping track of moves by personnel.

29. Service Pipe Line Company telephone directory now prepared by photographing tab run-off. Eliminated typing, proofing, and layout work.

30. Eliminated unnecessary routing on report of savings bonds purchased by employes. Quarterly report to U. S. Treasury now made in Payroll instead of Treasury.

31. Combined Payroll Folios 490 and 495 at Shawnee.

32. Mimeographed form letters now used in Right-of-Way department when mailing draft books and paying recording fees.

33. File information regularly used by Right-of-Way department, when making rental requests, placed in notebook thus eliminating repeated searching of files.

34. Detailed information on Tel and Tel collection statements eliminated by Right-of-Way since information shown on contracts.

35. Consolidated payroll work sheet replaced four separate ones in Payroll Section, Accounting department.

36. Revised procedure for making field purchases. Minimum purchase using Form 108, Field Purchase Order, raised to $50; payment for many items shifted to field cash account. Will eliminate approximately 75 percent of FPO's (25,624 written in 1957).

Reports and Statements

1. Eliminated monthly statement of contributions and memberships.

2. New method installed for reporting usage of heavy duty trucks. Eliminated tachometers.

3. Prepare financial statements quarterly instead of monthly.

4. Revised Crude Oil Stocks and Movements Report.

5. Combined two monthly payroll reports from Accounting to Industrial Relations department.

6. Discontinued checking in Accounting department of Authorization Completion Reports except on pipe and major property units.

7. Eliminated report to Maintenance department on new buildings constructed and old ones retired.

8. Eliminated monthly report on expenditures on "X" and "P" authorizations.

9. Eliminated monthly report on status of open authorizations furnished the field.

10. Prepare quarterly instead of monthly statement on use of sickness and disability plan.

11. Discontinued annual board and lodging survey.

12. Eliminated one report on status of merit increase plan.

13. Discontinued Weekly Progress Report, Maintenance department.

14. Discontinued monthly division activities letter from division managers.

15. Eliminated preparing summary of SOCo Statement No. 1.

16. Discontinued Division Gagers' preparation of monthly report to Tulsa on gaging operations.

17. Report of Tulsa pool cars changed from monthly to quarterly.

18. Eliminated duplication of field effort by Mobile Equipment section in preparation of progress report on open authorizations by reporting only on vehicles delivered in Tulsa.

19. Eliminated annual summary of SOCo Statement No. 11.

20. Changed report on Service Pipe Line Company's Purchases by Vendors on formal purchase orders from quarterly to semi-annually.

21. Changed commodity report from quarterly to semi-annually.

22. Discontinued weekly reports from machinist, connection foremen, electricians, construction foremen and chief station engineers in East Texas division.

23. Discontinued monthly reports from district superintendents and division gagers in East Texas division.

24. Discontinued monthly car and truck reports to East Texas office.

25. Changed district personnel reports in East Texas from monthly to quarterly.

26. Discontinued weekly reports on operations from field supervisors in Missouri-Illinois division.

27. Simplified preparation of weekly letters in Oklahoma division.

28. Changed Monthly Production Chart in Oklahoma to every fourth month.

Data Processing Equipment

1. Three payroll reports prepared more quickly through additional control panel wiring.

2. Prepare Form 135, Record of Employe Earnings, as continuous form.

3. Revised preparation of Participation in Savings and Stock Bonus Plan.

4. Revised posting of Semi-Annual Report of Power Furnished by Contractor.

5. Revised posting of Semi-Annual Report of Power Furnished by date and Lease Number.

6. Record of Employe Contributions and Retirements Credits put on continuous form.

7. Adapted preparation of Accrued Depreciation Reserve to business machine equipment.

8. Eliminated two quarterly wage and deduction reports since information available on a third regular report.

9. Machine printing of headings for ED-1 and SW-6 reports.

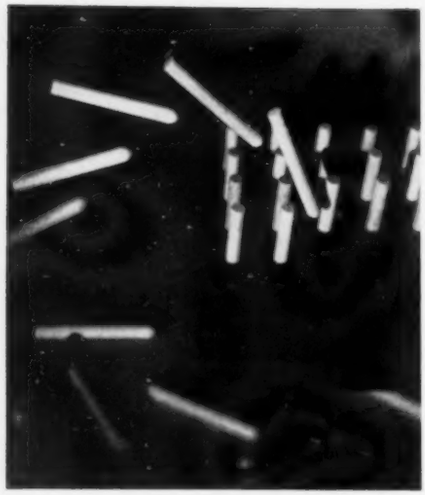
10. Machine calculation of value of pipe per mile replaced manual calculation in Tax department.

11. Revised tabulating cards for earnings, employe name, and insurance.

12. Monthly depreciation voucher No. 46 now prepared on tabulating equipment.

13. Tabulating equipment now used in place of hand posting for preparation of Thousand Barrel Mile Report.

14. Substantial detail on valuation report B.V. 588-R placed on tabulating equipment.



Only a game. Yes, but solving such problems as how to put the most pegs in their holes in the shortest time can help you make your own work easier.

adapt it to the company's particular needs.

Then came other sessions with Tulsa office people, about 20 in a group, each group spending 12 hours learning and practicing Work Simplification methods. At the same time, the training sessions were carried to the field, where they included all supervisory and clerical workers.

By the end of February, 1959, 16 groups in the Tulsa office and 28 in the field had been trained. Nearly 900 employes have now had these basic training sessions.

Using a Game as a Tool. If you walked in on one of these early training conferences, you might find students trying to discover the quickest way to fit wooden pegs into the holes in a peg board. A game? Possibly—but a game that illustrates dramatically one of the first principles of Work Simplification: it's not *what* you do but *how* you do it.

The peg board represents any problem. A better method of solving it results in accomplishing the same goal in a shorter time, with less effort.

One might also notice a small replica of a traffic signal. Its red and green lights illustrate one of the most vital features of the whole program: the attitudes toward new proposals. The red light of a closed mind—one that automatically says "it won't work"—bars the way to improvement. A green light attitude leaves the way clear to study a proposal and, if it's a good one, put it to use.

Visits to more of these sessions would disclose the philosophy of Work Simplification: that it's natural to want to improve unless prevented from doing so; that it's fun to work in an atmosphere where individual ideas for improvement are not just tolerated but actively sought; and that one is expected to work smarter —not harder.

It would also reveal the principles of Work Simplification: finding a job, or part of a job, that needs improvement; getting down on paper all the facts about the way it is now being done; questioning and challenging every detail; developing a better method of doing it; and putting the new method into practice.

How's Your I.Q.?*

Can you draw on your ingenuity to find a better and more efficient way to work?

Can you look at your own job, analyze it, and come up with a suggestion for an easier method of doing it?

Can you add a measure of importance to your job by eliminating unnecessary work and concentrating on productive effort?

Can you discover improvements that will bring you personal satisfaction and the recognition of your fellow-employes?

If you can do these things, you've demonstrated a high "ingenuity quotient." Scores of Service Pipe Line Company employes have already done so—through the Work Simplification program. The same inventiveness so often used in the past to improve technical operations has been applied by these people toward the more efficient use of time and effort in other fields.

*Ingenuity Quotient.

The Benefits. After training, the person can apply these principles to find a better way to do his job. As a result, in the first year of the program, 90 improvements have been officially approved and installed.

With these changes, Service is saving an estimated 25,000 man-hours yearly through the elimination of wasted effort.

Eliminating waste—especially unnecessary paper work—means a direct saving of money; and individual gain, although not as easily measured in terms of man-hours or dollars, is no less important. First of all, each individual makes his own job easier. He's asked to take an objective look at himself and his work, and in so doing he gets away from the staleness of an unchanging, day-by-day routine. He sees his own ideas put to good use. And probably best of all, he gains a measure of personal satisfaction and recognition for the contributions he makes. The more he can do toward eliminating waste and improving efficiency, the more important his own job becomes.—**The End**

The green light (one helpful session prop) sets the pace for the work simplification idea sessions. The way is "clear" for each proposal that is brought up until it gets a thorough going over and is found workable or not.

Conclusive evidence proves

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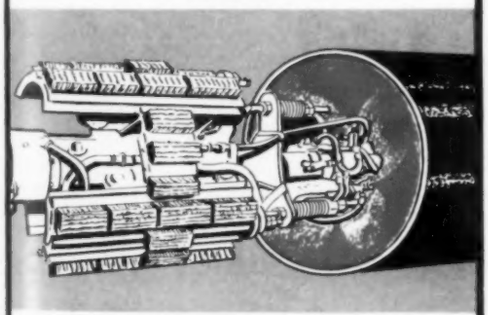
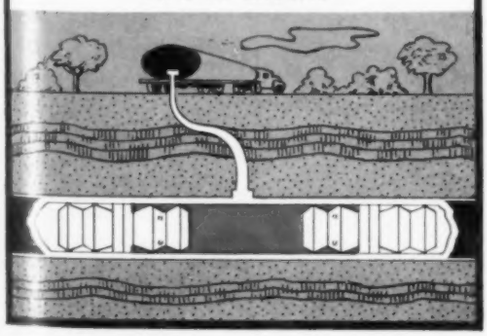


PIPE IN GROUND



Extensive tests conducted by major transmission firms

Now, proof positive that Copon Internal Pipe Coatings do even more than provide outstanding corrosion protection, reduce maintenance costs, and make possible delivery of cleaner gas products. Recent tests conducted by major gas transmission firms **prove conclusively** that Copon Internal Pipe Coatings improve the efficiency and performance of a pipeline system. The smooth interior finish of Copon Coated Pipe *permits greater thru-put . . .* makes possible *reduced pumping costs.*

These tests are the most recent development in a continuing research program being carried out by the manufacturers of Copon. All Copon Internal Pipe Coatings are developed in close cooperation with pipe line engineers, corrosion engineers, coating applicators and equipment manufacturers. The information gained from this research is available to the purchaser in the form of a complete technical service. **When you specify Copon, you get the performance you pay for.**

● *Ask your Copon representative for complete information on Copon Internal Pipe Coatings . . . and for specific information on increased thru-put and reduced pumping costs.*

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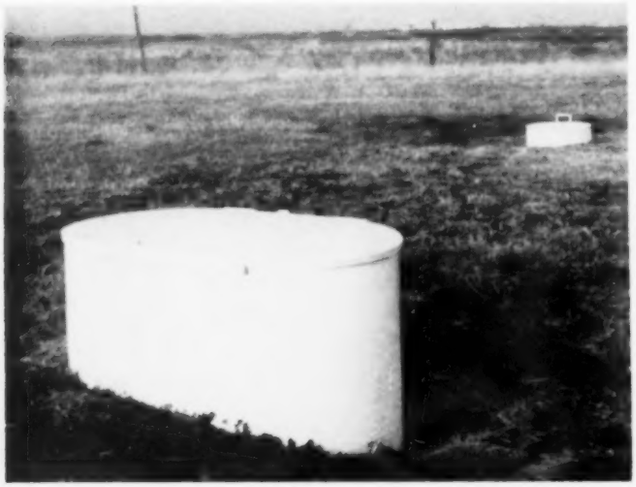
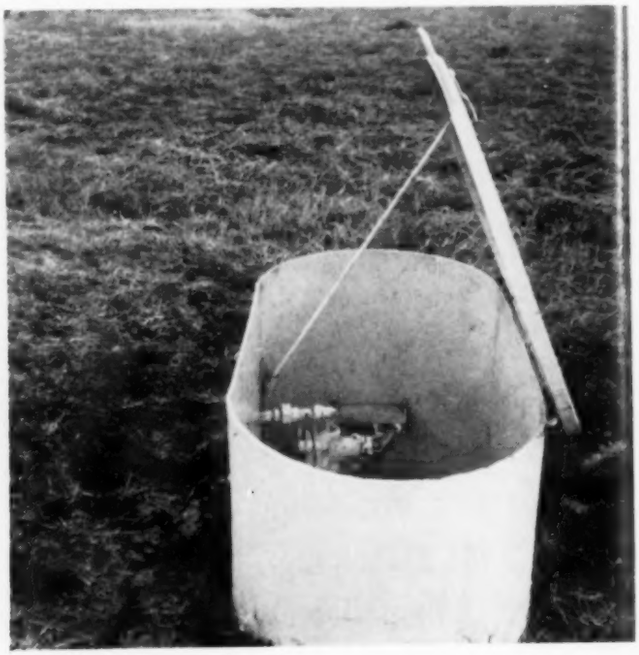
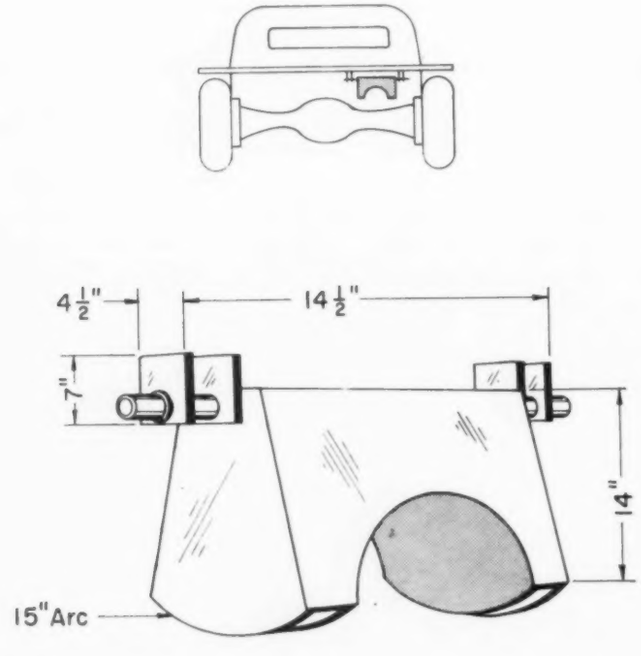




How to Construct a Safe, Clean Blow-off For a Drip

Two neat white metal pipe boxes are the only evidence of a drip blow-off. One of them houses two valves on the line that comes from the pipe line drip. The other is simply a container which holds blown condensate. Inside the latter there is a connection for a hose which can be run to a tank truck; however, where the gas is dry, and the condensate clean, it is allowed to simply accumulate in the tank, and between blowings, it usually evaporates.

At right, is a close-up of the valve installation. Note that the underground housing was made from pipe and steel plate. The depth is sufficient to reach the pipe line some 30 inches down. The two valves on the drip line are simply a means of insuring shut-off. The cover on the boxes is made of plate with hasps for padlocking.

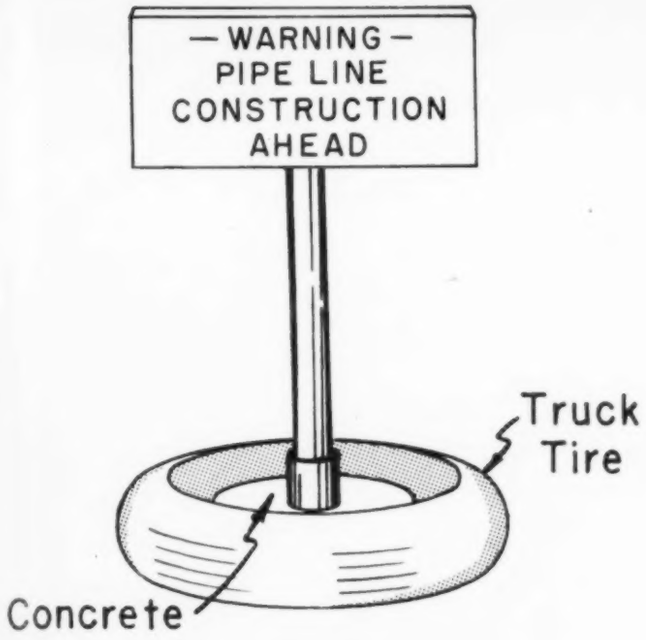


Bending Shoe Under Truck Bed Speeds Small Line Repairs

A light bending shoe which can be mounted beneath the body of a winch truck can speed repair of small diameter lines. The shoe is made of steel plate and a bent piece of pipe—of a size larger than the pipe to be bent by the truck.

Details of the device are shown in the drawing. It mounts on the rear frame of the truck bed, offset sufficiently for the pipe to lay beneath the truck and miss the differential housing. The gin poles and winch line are used to lift the pipe into the shoe and make the bend.

After fabricating the shoe, it should be dressed with a grind wheel to remove all burrs and sharp edges that could scratch the pipe during bending. A hook and chain should be attached to the shoe to hold it in proper traveling position while going to and from the job.



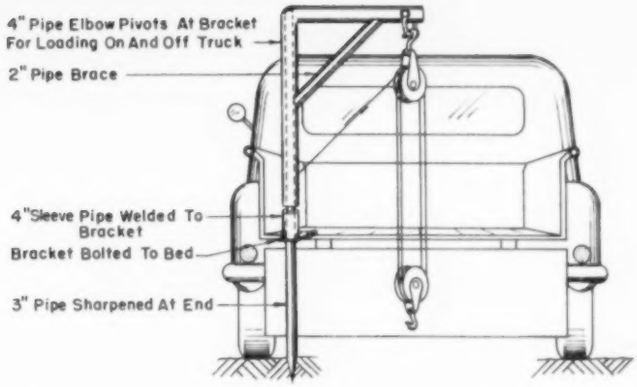
Old Truck Tire Makes Base for Warning Sign

In heavily populated sections of the country, warning signs should be spaced about pipe line construction jobs. Shown here is an inexpensive means of making a sign that is not easily damaged in construction handling.

The base of the sign is an old tire poured full of concrete and reinforced with light steel. Four "spokes" of 1½-inch pipe are poured in the concrete. The latter join at a hub of 2-inch pipe and extends up above the concrete.

The upper end is threaded, and the 2-inch pipe stand makes up onto it. The sign proper is mounted on a frame that bolts onto the pipe stand.

Between jobs, the sign can be broken down into three parts, all of which are easily stored.


4" Pipe Elbow Pivots At Bracket For Loading On And Off Truck
2" Pipe Brace
4"Sleeve Pipe Welded To Bracket
Bracket Bolted To Bed
3" Pipe Sharpened At End

Use Gin-Pole On Pick-Up Trucks to Lift Heavy Loads

Fabricate a bracket that bolts onto the bed of a pick-up truck and a two-piece gin-pole, the bottom of which can be driven into the ground, and you have a more serviceable truck in many ways. One man can lift heavy loads into the truck unassisted and the pole can be used for other maintenance tasks.

The bracket that holds the guide can be bolted to one of the back corners of the bed. Each time the pole is to be used, the guide will have to be bolted to this bracket.

The lower section of the gin-pole is simply a straight piece of 3-inch pipe with a pointed end. It should be about 7 feet long and should fit the guide snugly. The upper section of the gin pole should be made of 4-inch pipe, "L"-shaped as shown with a 2-inch angle iron brace. This piece fits over the 3-inch pipe and rides on the guide as the load is applied.

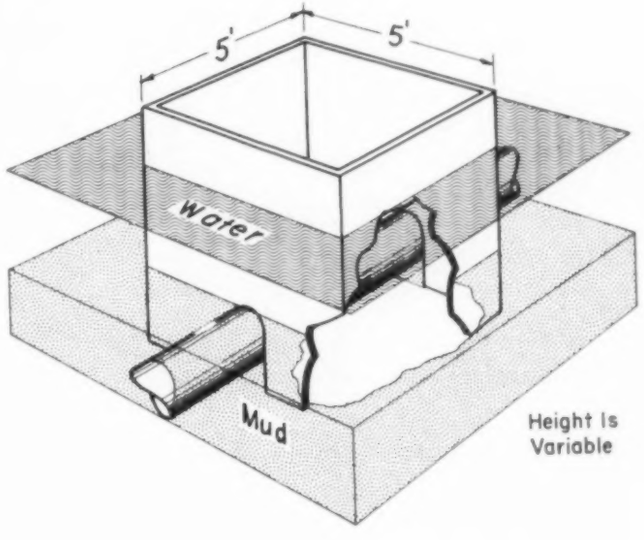
The most expensive item involved is a pair of blocks that will handle the loads to be lifted.

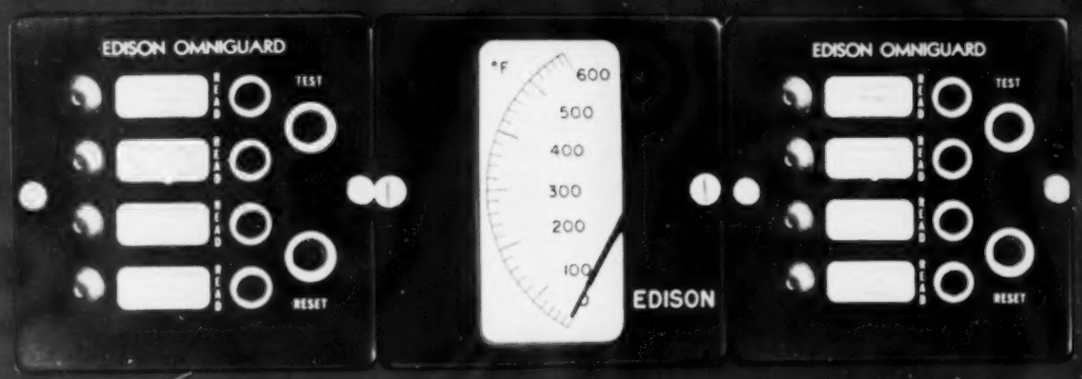
This pole should be used only where it is possible to drive the bottom section into the ground or brace it to prevent overturning.

Caisson May Eliminate Need of Raising Line in Marsh Country

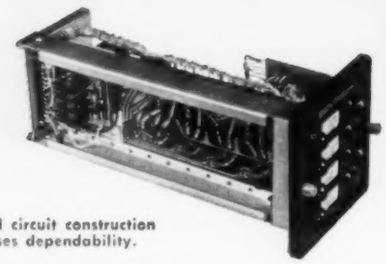
A simple caisson on occasion may save the work of two draglines and a large crew of men. Where a line crosses swampy land, making a hot tap poses a problem. One solution is to strip the backfill off the pipe for some distance on either side of the proposed tap and lift the line clear of the water. Another method is to construct a temporary cofferdam around the bell hole and keep it pumped dry. But on two occasions in the past and presumably many more in the future, the caisson shown here has enabled one company to make hot taps on lines in the swamp land with a minimum crew.

The caisson was constructed of scrap steel. Its height is sufficient to reach the top of the bell hole. By placing the caisson above the pipe, excavating and pumping it down, the company, twice eliminated the need for raising the line for a hot tap. Once down, rags, etc., were stuffed around the pipe to minimize leakage.

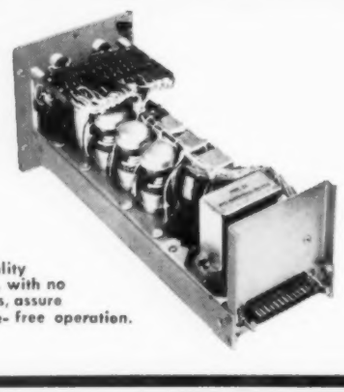




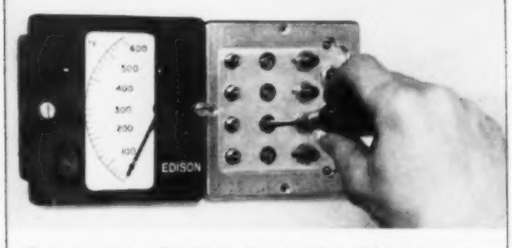
Model 310 Edison Omniguard with Model 311 Indicator — a single indicator can read any number of temperature points.



Printed circuit construction increases dependability.



Highest quality components, with no moving parts, assure maintenance-free operation.



Easy access to all components permits quick temperature settings and monitoring system changes - at any time.

THOMAS A.

EDISON

new model 310 omniguard temperature monitor... unmatched for versatility

The new Model 310 Edison Omniguard provides the simplest, most dependable temperature detection system yet devised... for both small and large installations.

The Omniguard system is reliable... flexible... economical. You order only the plug-in units needed, add new units as your monitoring needs expand.

Check these features of the new Edison Omniguard:

1. **VERSATILE:** One instrument can be used for both normally open and normally closed annunciator... for alarm or for shutdown of equipment.
2. **FLEXIBLE:** Quick, inexpensive system changes and additions . . . easy tie-in with any type annunciators or cut-off switches.
3. **DEPENDABLE:** Rugged design with highest quality components, no fragile moving parts.
4. **SIMPLE:** Single indicator reads any number of temperatures, needs no periodic adjustment. With a minute's briefing, *anyone* can operate the simple Omniguard monitoring system.
5. **LOW COST:** Plug-in units can be custom-tailored to your exact requirements . . . order additional units only when needed.

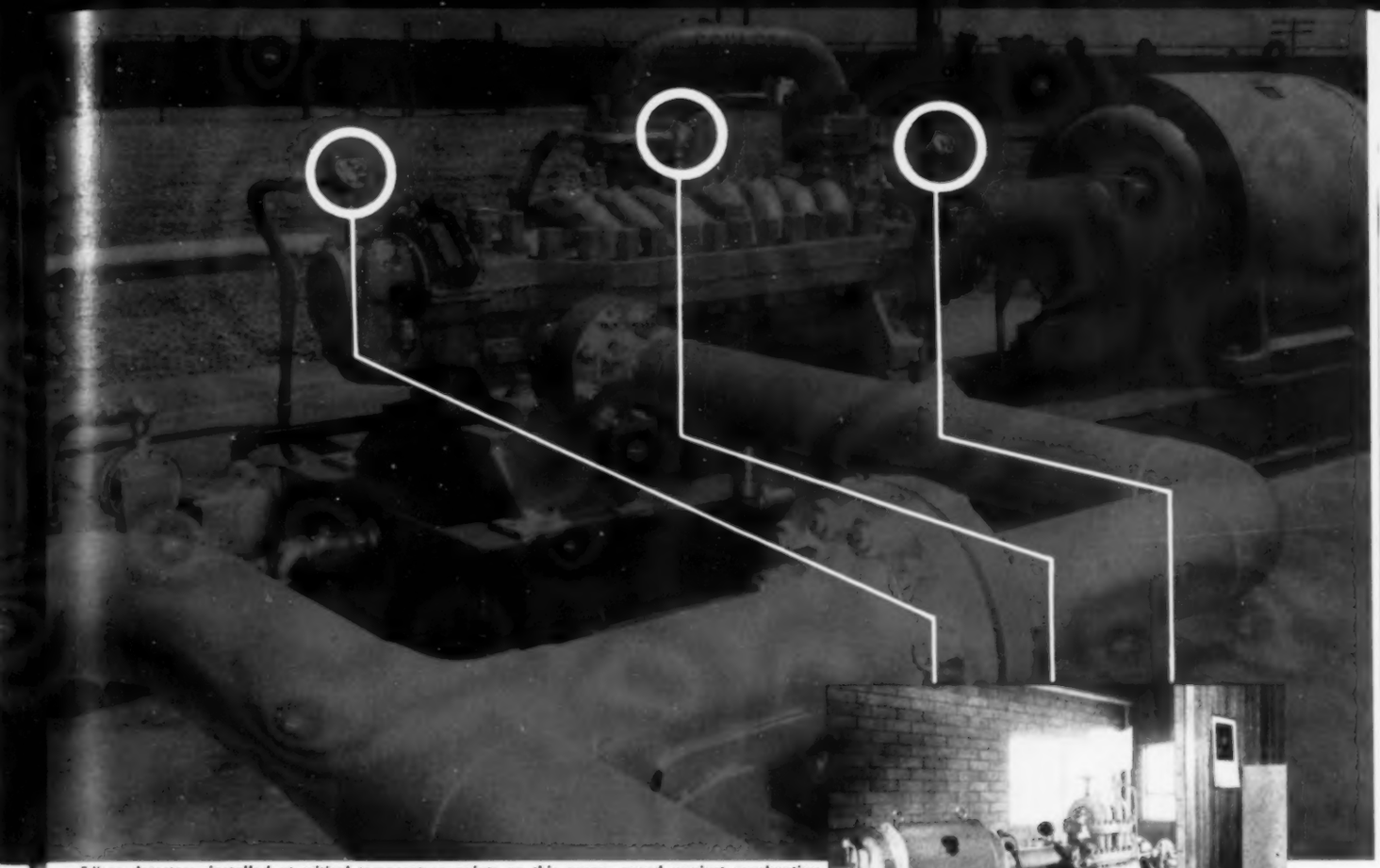
Thomas A. Edison Industries

INSTRUMENT DIVISION

95 LAKESIDE AVENUE, WEST ORANGE, N. J.

McGRAW EDISON

EDISON ENGINEERING OFFICES ARE LOCATED IN: WASHINGTON—BALTIMORE; CHICAGO; DALLAS; DAYTON; LOS ANGELES



Edison detectors, installed at critical temperature points on this pump, guard against overheating.

THOMAS A.

EDISON

omniguard systems protect unattended pipeline booster stations

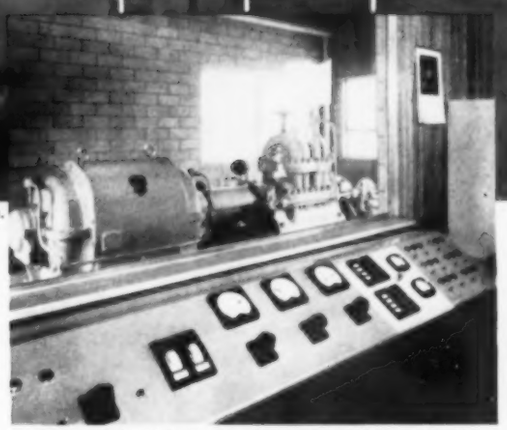
To pump more oil at less cost, pipe line operators use satellite booster stations. These stations are unattended. In order to protect critical equipment operators rely on Edison Omniguard temperature monitoring systems.

Omniguard detectors are installed at critical temperature points such as inboard and outboard sleeve bearings on the motor, inboard and outboard ball bearings on pump. In addition, they monitor pump casing temperature, and temperature of oil on discharge side of pump.

Indicating panel is usually located in supervisory station miles away. In event of overheating, pumping motors are immediately shut down and information is automatically relayed to supervisory station. Trouble-shooting personnel are quickly dispatched to put station back in operation, or standby equipment can be automatically cut-in by Omniguard.

This reliable, economical system is playing a major role in insuring the continuous, profitable operation of more and more pipe line stations.

If you would like further information about the Edison Omniguard system, write for publication 3036C.



Omniguard and indicating units are installed in control console. Warning system identifies a hot bearing by an alarm light and automatically shuts down the equipment. Indicators enable operator to read exact temperature of all bearings from console.

Pump and motor at pipeline booster station, showing Edison detectors (circled) on inboard and outboard pump bearings and pump casing.

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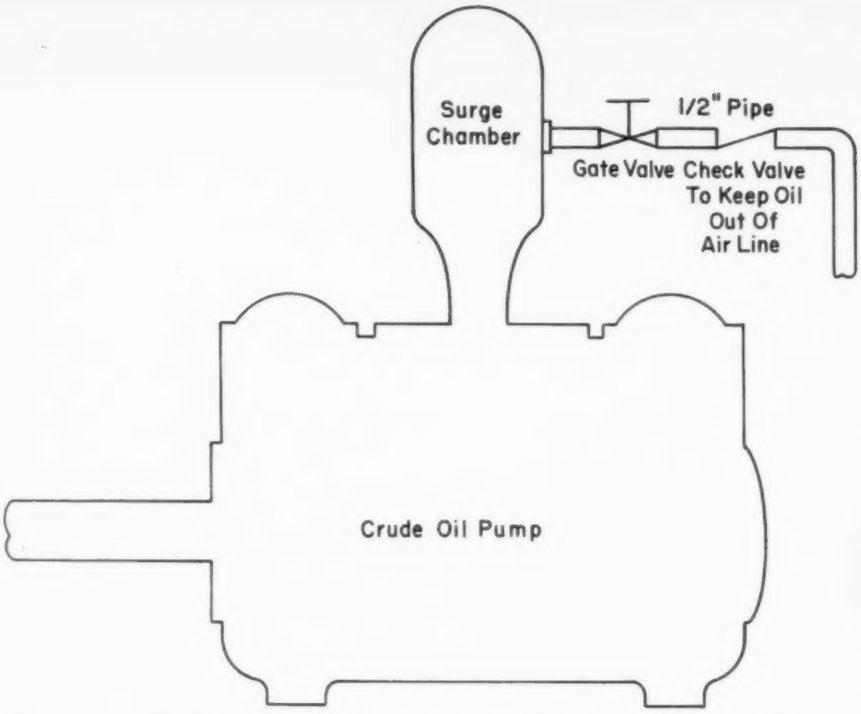
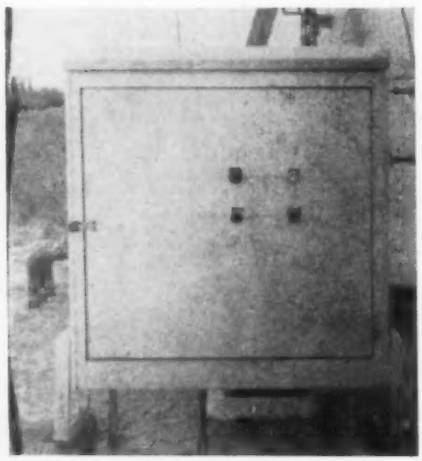
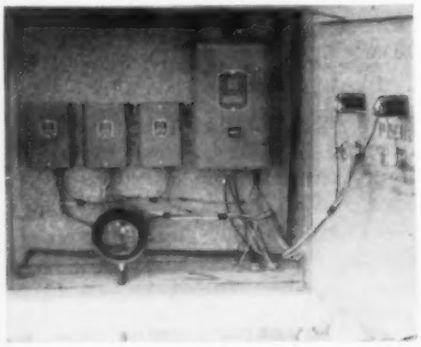


Check Valves on Lines to Surge Chambers Protect Against Possible Engine Explosion

By installing inexpensive ½-inch check valves on the air supply lines that run to the surge chambers on crude oil pumps, one company eliminated a serious hazard. The cost ran only $2.50 per valve; the damage that could result from the introduction of hydrocarbons in the starting air system could be great. For one thing, if the valves at the surge chamber should leak, crude oil could back up into the air system, it could cause a diesel type explosion or perhaps an explosion in the engine during start-up.

The small safety precaution could save a life.





Put Automatic Controls In Surplus Meter House

These two photographs show the installation in a surplus meter house of the electrical automatic control components for a field pipe line system. This method for housing electrical control items is applicable to automatic tank switching systems, automatic well testers, LACT systems, etc. The method offers several advantages over pole mounted installations. These advantages are:

1. All electrical components may be "open" or in "general purpose" enclosures (as shown) instead of in more expensive water tight enclosures required for pole installations.

2. Interconnecting circuits may be exposed instead of installed in conduit. The installation therefore is much faster and cheaper and circuits are more easily traced and modified.

3. Switches and indicating lights may be mounted directly in the door instead of in a special enclosure.

4. Service and inspection are facilitated by the roomy interior of the house and the wide opening doors. The wooden bottom affords a convenient shelf for meters and tools during construction.

Rubber Foam Cushion Protects Instruments

A foam rubber pillow can be used to line your instrument cases if you want the very best protection for delicate instruments.

Shown here is an instrument case for a hydrometer (for measuring the moisture content of the air). The outside container is a conventional wooden instrument case; and the inside—top, bottom and sides—is lined with one-inch thick sections of foam rubber, right off the bed, so-to-speak. For best results, make the instrument fit snugly—especially top and bottom. This will reduce the vibration and jiggling the instrument receives on long automobile rides over rough country.

Editorial Index Now Available

The 1958 Editorial Index is now ready for distribution. This Index provides a time-saving entry into all 12 issues of PIPE LINE INDUSTRY published in 1958.

Bound in a handy pamphlet form for easy accessibility, the Editorial Index lists each and every article and its author. To get a copy, write Librarian, Gulf Publishing Company, P. O. Box 2608, Houston 1, Texas. Or, if you prefer, check the square provided on the blue Reader's Service Card at the back of this and every issue of PIPE LINE INDUSTRY.

Be assured of getting your copy by ordering your Editorial Index now. The supply is limited.

Rules of Thumb

and Engineering Data Sheets for the Pipeliner's field notebook

$25 for Engineering Data Sheet $15 for Rule of Thumb

These practical aids give quick, reasonably accurate answers to design, maintenance and cost estimating problems. PIPE LINE INDUSTRY will pay $25 for each chart, nomograph or data sheet published—$15 for each Rule of Thumb. Send your ideas to PIPE LINE INDUSTRY, P. O. Box 2608, Houston, Texas

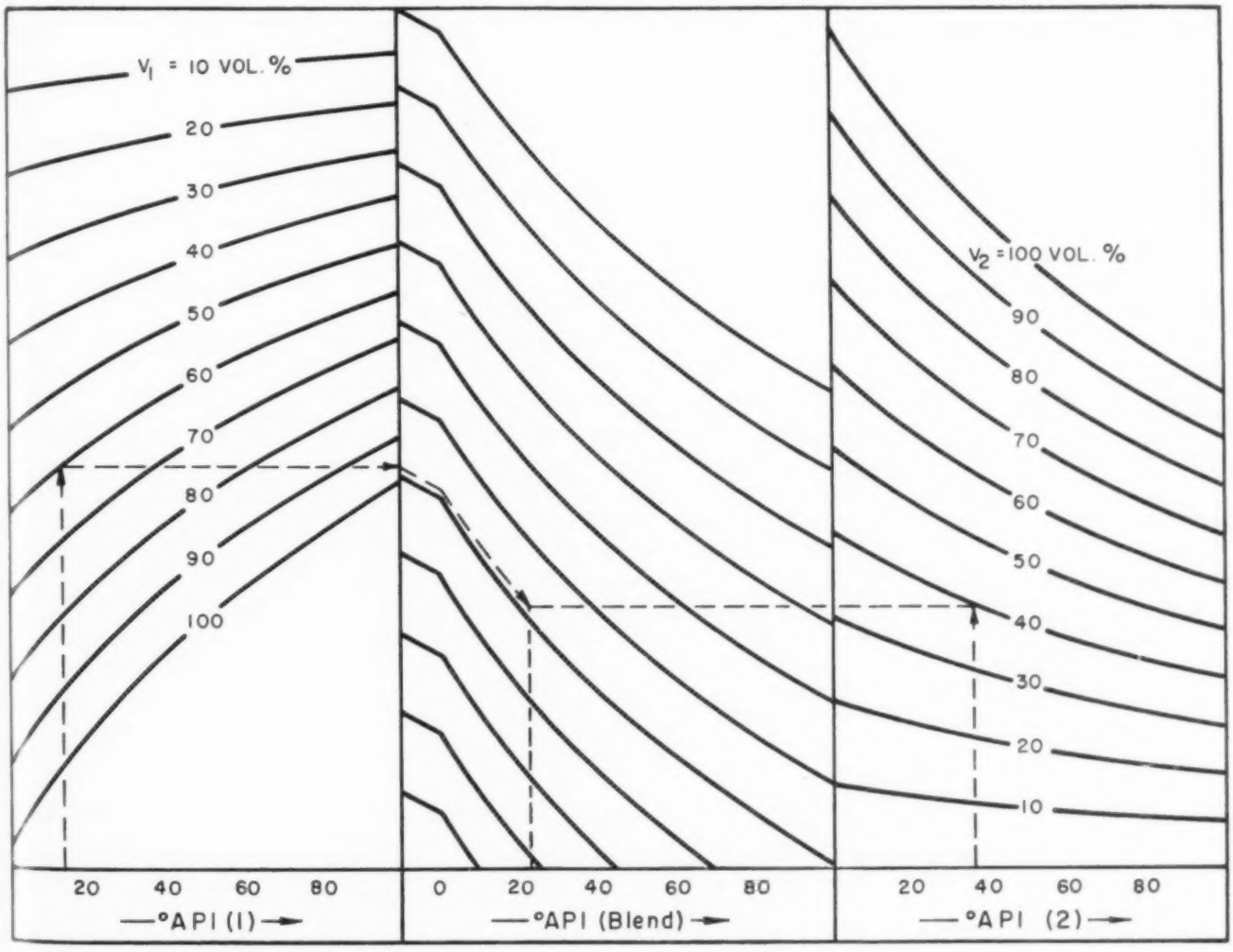
Miscellaneous

—37—Chart Gives API Gravity of Blends Quickly

API gravity of a crude oil blend may be readily estimated from the gravity of the components and their percentage composition. It is a simple procedure to use these curves to find the resulting API gravity of the blend.

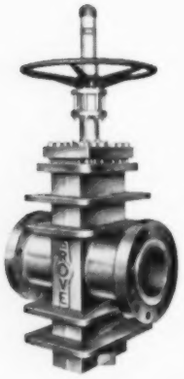
Example: If you blend a 14 degree API pitch (60 percent) with a 36 degree API cutting stock (40 percent), the resulting fuel oil has an API gravity of 22 degrees as read from the nomograph. Calculated result from gravity tables would be 22.1 degrees API.

Results found using this nomograph checked out within one degree API over the range of gravities and percentage of components (1) and (2) in the below nomograph. Estimates from the nomograph are based on the assumption that volumes of blends are additive and that no light components flash off in blending.



Strapped with a barrel of trouble?

GROVE valves never require lubrication



Get rid of the load of lubrication with Grove Seal-O-Ring gate valves. Save the countless man hours, expensive supplies and equipment required to maintain ordinary valves. Grove valves work without lubricant or sealing compound. Tough, resilient Hycar "O" rings—in the valve seats—wipe the gate face clean of foreign matter which might cause sticking or distortion...seal bubble tight on both sides of the gate... There's no fear of valve failure because of forgotten lubricant or depleted sealing compound. And you eliminate the danger of contamination or meter fouling resulting from lubricant or sealing compound entering the line.

Unload your troubles...Specify Grove Seal-O-Ring gate valves...for pipeline or production services.

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5439

WHAT'S HAPPENING
IN PIPE LINE CONSTRUCTION

By Donald G. DePugh, Construction Editor

Transco Hearing Set By FPC for May 18

The Federal Power Commission has scheduled a hearing on Transcontinental Gas Pipe Line Corporation's application to construct facilities costing $69 million.

The 1959 construction project includes 288 miles of looping and installation of an additional 61,380 horsepower in two new and 11 existing compressor stations.

Approximately 150 miles of 36-inch main line loops will be installed as the first segments of Transco's third parallel line from Texas to New York. Loops will be spread over Louisiana, Mississippi, Alabama and Georgia.

The proposed facilities would provide an additional 145 MMcf of gas daily and would bring Transco's peak day delivery capacity to 1,336 MMcf.

Included in the project is several lateral and gathering lines to receive gas in Louisiana.

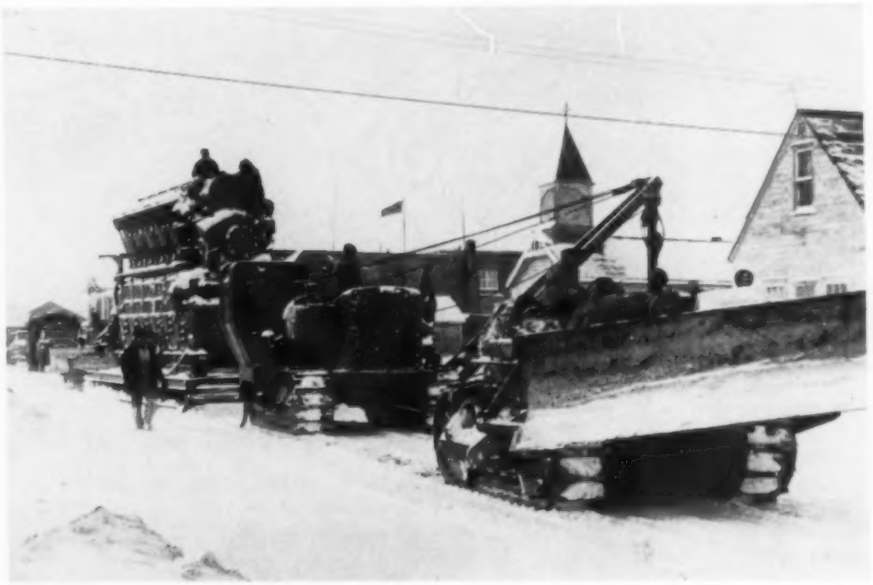
TGT Awards Contract to Houston Contracting Co.

Tennessee Gas Transmission Company awarded a contract to Houston Contracting Company to lay 20 miles of 10-inch concrete coated pipe in the Atchafalaya Bay area, St. Mary Parish, La.

Texas Illinois Co. Files Application with FPC

Texas Illinois Natural Gas Pipeline Company has filed an application with the Federal Power Commission seeking approval to construct facilities at a cost of $4 million.

Texas Illinois plans to construct 10 miles of 8-inch pipe in Hidalgo and Starr counties, Texas. The line would be operated by South Texas Natural Gas Gathering Company, which proposes to sell gas to Texas Illinois. The application also seeks permission to install a total of 16,000 horsepower at eight main line stations in Texas, Arkansas, Missouri, and Illinois.



Trans-Canada Station Additions

Trans-Canada Pipe Lines Limited moves a compressor engine through the city of Geraldton, in Northwestern Ontario, en route to a compressor station under construction 13 miles from Geraldton. One of four engines to be installed at Geraldton, the 2,500 horsepower, 100-ton engine was pulled over the streets on a sled with two bulldozers pulling and two pushing. Trans-Canada is constructing stations at Geraldton, Ignace, Hearst, and Maple, Ontario, at an estimated cost of $13 million. With completion of the 1959 construction program, the 2,290-mile gas system will have a total horsepower capacity of 65,000. Further expansion includes about 500 miles of looping by 1962 and addition of compressor station facilities raising horsepower to 304,500 by 1965. A main line extension from Montreal to Quebec is planned. The Trans-Canada system, which was completed in 1958, delivers approximately 280 MMcf of gas daily.

Gas Line From North Africa To Central France Considered

Engineering studies are being made on a 1,400-mile, 30-inch gas pipe line from North Africa's gas fields to Central France. Tentative plans call for a line delivering 300-400 MMcf daily.

The line will cross the Mediterranean at the Straits of Gibraltar, extend through Spain and over the Pyrennes to industrial centers in France.

Oceanography studies from Texas A&M College regarding currents are being used in planning the Gibraltar crossing. The crossing of the Mediterranean will probably consist of twin jacketed lines.

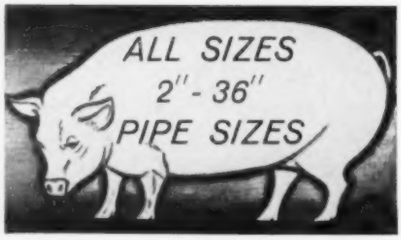
The project is based on the fact that gas can be delivered to industrial areas in Europe cheaper than the cost of coal on a Btu price basis.

Northern Natural Awards Contract to R. H. Fulton

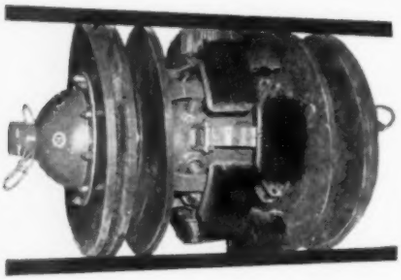
R. H. Fulton & Company has been awarded contract by Northern Natural Gas Company to construct two short 30-inch gas lines.

One section extends 11 miles north of Sun Ray, Texas. The other extension runs 8 miles north of Beaver, Okla.

MYOCO PIPELINE PIGS



ANY COMBINATION ALWAYS IN STOCK



MYOCO S-18 COLLAPSIBLE PIG

Especially designed for use on dual diameter lines and lines with small I. D. full opening valves within collapsible range. Sturdily built of lightweight aluminum castings with spring loaded brushes and collapsible rubber discs, the S-18 assures maximum cleaning action.

COLLAPSIBLE SIZES: 36" to 30", 30" to 24", 24" to 20" and 20" to 18".

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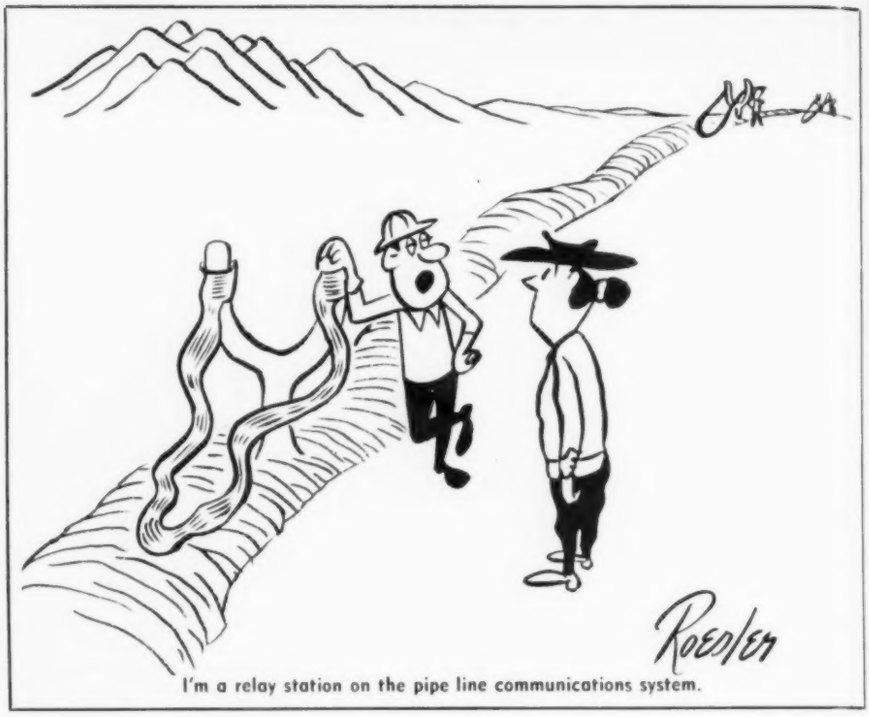


I'm a relay station on the pipe line communications system.

New York State Natural Lets Contract on 14 Miles

New York State Natural Gas Company has awarded a contract to Williams Brothers Co., to take up 14 miles of 14-inch and lay 14 miles of 26-inch between Little Marsh in Chatham Township, to Boom station near Lawrenceville, Penn.

Construction scheduled to start early in April.

Michigan Consolidated Announces Construction Plans

Michigan Consolidated Gas Company announces plans to construct a 53-mile, 30-inch loop line and install a 20,000 horsepower compressor station in 1959.

The 30-inch line, estimated to cost $6.6 million, will parallel two 24-inch lines from a point near Milford to Elsie in Clinton County.

Compressor additions include Michigan's second 20,000 horsepower station to be constructed at its Six Lakes Field near Edmore, Mich., at a cost of $6 million. At its Woolfolk compressor station, Michigan Consolidated will add 8,000 horsepower, spending nearly $3 million. Some $2 million will be spent on other storage fields the company is developing in central Michigan.

Pemex Plans Construction Of 214-Mile Products Line

Petroleos Mexicanos is planning a 214-mile, 10-inch products line running from Monterrey to Torreon, Mexico. Pemex is reported negotiating financial backing for the $6.5 million project.

Specify **PELCO** Welding Saddles

Quoted from Mr. Dillard Stokes' Column, Shreveport Journal, Oct 13, 1958..
"President Jefferson feared the justices some day would do what they now are accused of. A few months before he died President Jefferson wrote: 'There is no danger I apprehend so much as the consolidation of our government by the noiseless, and therefore unalarming, instrumentality of the Supreme Court'."

PELICAN SUPPLY CO. INC.

P. O. Drawer 1108 Shreveport (84), La.

SEE YOUR NEAREST SUPPLY HOUSE

Texas Gas Awards Contracts On Major Expansion Program

Texas Gas Transmission Company awarded a contract to Houston Contracting Company on construction of 42 miles of 30-inch loops.

Construction will begin early in April on the loops in the vicinity of Ville Platte, Jena, and Bastrop, La.

United Gas Lets Contract To Houston Contracting Co.

United Gas Pipe Line Company has awarded contracts to Houston Contracting Company for approximately 41 miles of 30-inch in two loops.

The project includes a 12-mile segment between Kiln and Gulfport, Miss., and a 29-mile section between Gulfport and Whistler Junction, Ala.

The looping project is a part of United's program looping its line from New Orleans to Mobile, Ala.

Coastal States Plans 60-Mile Gathering System

Coastal States Gas Producing Company will construct a 60-mile gathering line to supply a steam generating plant being built in Pearsall County, Texas.

The line will be an extension of the company's South Texas gas gathering system. Construction is scheduled to start soon and completion is expected by 1960. Uncompressed capacity of the line will be over 20 MMcf of gas daily.

The line will cost about $850,000.

Submarine Gas Line Under Study by Canadian Firm

Engineering studies have been made on a submarine gas transmission line across the straits between Vancouver Island and Vancouver, B. C.

Island Transmission Company Limited will build and operate the twin 10-inch lines which would be the deepest underwater lines constructed at 745 feet below the surface.

The project includes two inland 10-inch lines extending from the main line to Victoria and Nanaimo, B. C.

The twin submarine lines consist of four separate portions totaling 25 miles. The inland pipe lines will total 67 miles. Construction on the $14 million project is scheduled to start in 1960.

Canadian Contractors Board of Directors

The Pipe Line Contractors Association of Canada elected officers for 1959 at its fifth annual convention in Bermuda, February 25-28. D'Arcy J. Baldwin, of Marine Pipeline and Dredging Ltd., has been elected president. Board of directors include, standing, left to right: E. A. Hooper, F. E. Shaw, Ltd., second vice president; Robert B. Somervilles, Robert B. Somervill Co. Ltd., director; R. K. Banister, Fulton Banister Ltd., director; W. Douglas Porter, director, and A. O. Ackroyd, executive secretary. Seated, left to right, are George Wilkinson, Marwell Construction Co. Ltd., treasurer; D. J. Baldwin; Gordon Walker, Mannix Co. Ltd., first vice president, and C. A. Callahan, Majestic Contractors Ltd., 1958 president.

Saskatchewan Power Co. to Lay 270 Miles of Gas Lines

Saskatchewan Power Corporation has asked for bids on three projects calling for 270 miles of gas lines in Saskatchewan, Canada, ranging from 4 to 10-inch pipe.

Lines include, 52 miles, 6-inch and 24 miles, 4-inch from St. Louis to Tisdale; 79 miles, 10-inch from Success to Rosetown; and 113 miles, 8-inch from Regina to Yorktown.

Alaskan Gas Line Proposed From Gubik to Fairbanks

Colorado Oil & Gas Corporation is considering laying a 400-mile gas line from Gubik to Fairbanks, Alaska, at an estimated cost of $42 million.

Gas carried to Fairbanks would serve both industry and military installations at Fairbanks.

Contracts for Underwater Lines in Venezuela Let

Contracts have been awarded for construction of two underwater water pipe lines in Venezuela. A 15-mile, 30-inch fresh water line from the Isle of Margarita to the Venezuela mainland and a 7-mile, 8-inch line from the mainland to Isle of Coche will be constructed at the estimated cost of $14 million.

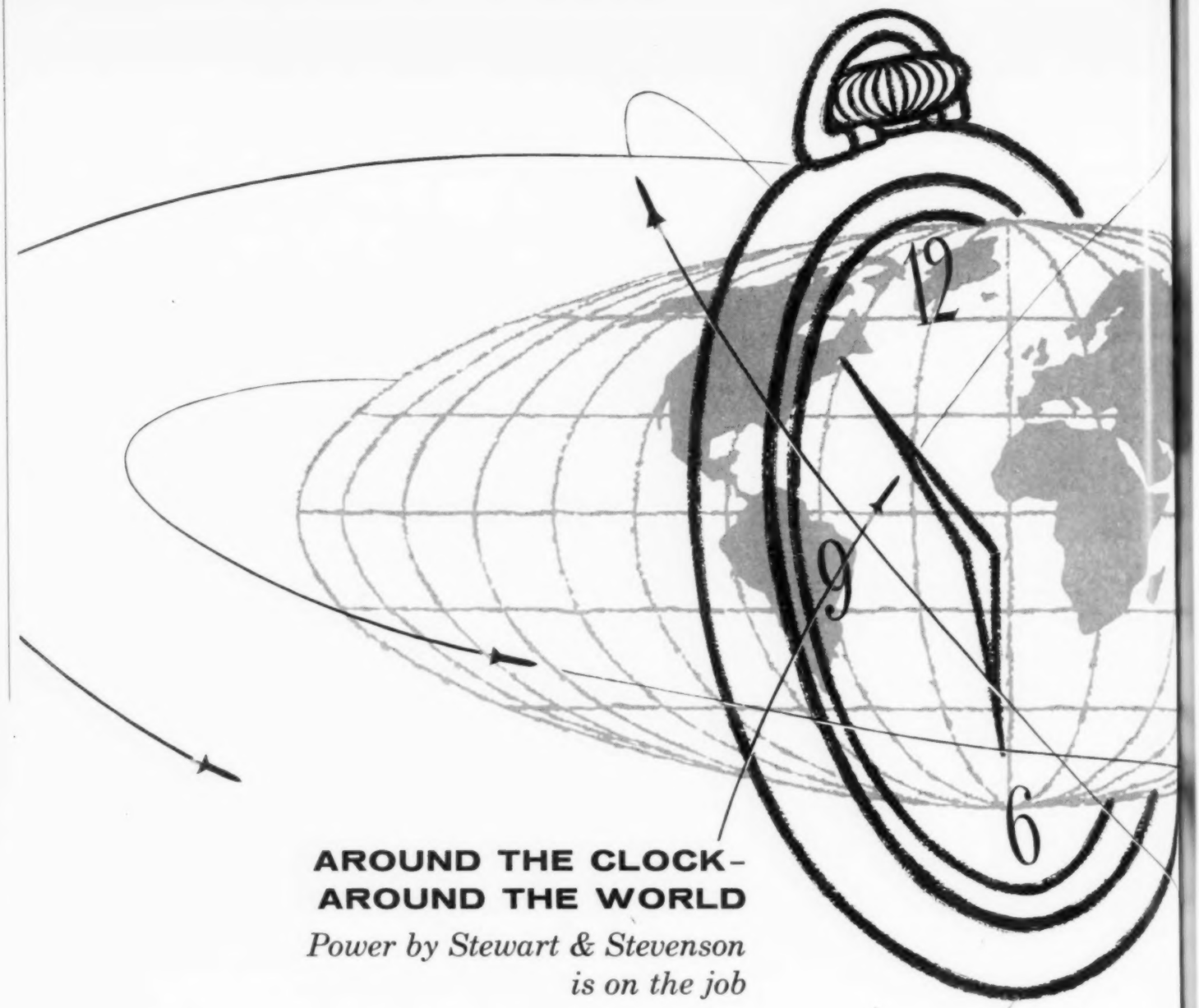
Instituto Nacional de Obras Sanitarias let contracts to Construcciones Collins de Venezuela, C.A., C.A. De-Long de Venezuela, and Constructora Tecnica of Caracas.

Both lines will consist of ½-inch wall welded steel pipe, coated on the inside and outside with concrete.

FPC Map on Major Gas Pipe Line Available

The Federal Power Commission has announced it's annual map on major natural gas pipe lines is available. The map shows all major lines in operation, certified to be constructed and those pending commission action.

Cost of the map is 25 cents and can be obtained by writing Federal Power Commission, Washington 25, D. C.



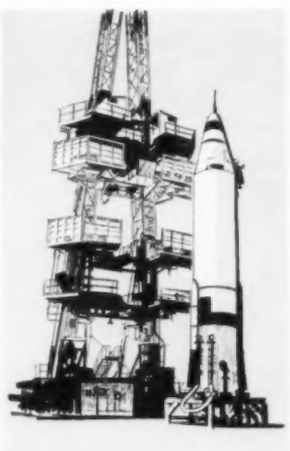
AROUND THE CLOCK–
AROUND THE WORLD

Power by Stewart & Stevenson
is on the job

Whether it's an oil well drilling rig or a launching site for guided missiles—if it uses diesel or gas engine power—you'll probably find that it is powered by Stewart & Stevenson Services.

Here again, as in thousands of commercial applications for the petroleum, industrial and construction industries, Stewart & Stevenson's experience and "know how" is paying off.

If you have a power problem—no matter how difficult or complex it may seem—it's probably "routine" with Stewart & Stevenson. Why don't you take advantage of this experience?



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Representatives:	Longview, Brownsville, Wichita Falls, Freeport
Export:	Room 1405, 74 Trinity Place, New York, N. Y.

STEWART & STEVENSON

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

El Paso Gas Co. Files Application With FPC

El Paso Natural Gas Company has filed a budget-type application with the Federal Power Commission seeking permission to construct facilities costing up to $5 million in 1959.

El Paso said the new facilities would allow it to take into its main line new supplies of gas. Proposal includes lateral lines from 4 to 20-inch, compressor facilities varying from 300 to 1,600 horsepower, purification and dehydration facilities and gasoline plant facilities.

Phillips Lets Contract To Connor Construction Co.

Phillips Petroleum Company has awarded a contract to Connor Construction Company to construct a 53-mile, 3-inch gasoline line from a Crane County gasoline plant to nearby Fort Stockton, Texas.

Transco Denied Permission To Carry Utility's Gas

Transcontinental Gas Pipe Line Corporation has been denied Federal Power Commission permission to transport gas for Consolidated Edison Company of New York.

The proposed transportation service involved construction and operation of facilities costing about $20 million, necessary to increase Transco's capacity by 50 Mmcf per day.

The FPC also denied Transco a request to sell gas to Lynchburg Gas Company's subsidiary, Lynchburg Pipe Line Company, which in turn would resell gas primarily to an industrial user.

Editorial Index Now Available

The Editorial Index is now ready for distribution. The 1958 Editorial Index provides a time-saving entry into all 12 issues of PIPE LINE INDUSTRY published in 1958.

Bound in a handy pamphlet form for easy accessibility, the Editorial Index lists each and every article and its author. To get a copy, write Librarian, Gulf Publishing Company, P. O. Box 2608, Houston 1, Texas. Or, if you prefer, check the square provided on the blue Reader's Service Card at the back of this and every issue of PIPE LINE INDUSTRY.

Be assured of getting your copy by ordering your Editorial Index now. The supply is limited.

Lincoln WELDYNAMICS

NEWS ABOUT ARC WELDING AT WORK CUTTING COSTS

SPECIAL ROOT PASS ELECTRODE MAKES PIPE WELDING EASIER

The few contractors who have switched electrodes from their old standby Fleetweld 5 to its newer twin brother Fleetweld 5-P, designed especially for pipeline welding, are reporting that the exceptional operating characteristics of Fleetweld 5-P electrodes make weldor qualification almost automatic.

The softer, steadier arc makes acceptable welds easier to make. Reduces "windows", eliminates "wagon tracks". One pipeliner says that where 15% to 20% of men trying to qualify as pipeline weldors used to fail, now more than 95% pass when they use Fleetweld 5-P.

Another contractor claims x-ray quality with Fleetweld 5-P is so much better that cutouts have been reduced 50%.

Although some highly skilled old timers will always prefer to use Fleetweld 5, many are finding Fleetweld 5-P even better. Have you tried Fleetweld 5-P yet?

THE LINCOLN ELECTRIC COMPANY

Dept. 5106 • Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

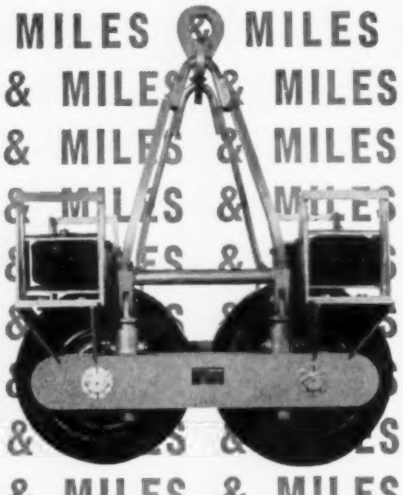
U. S.

Alaska Juneau Gold Mining Co., Los Angeles, 425 miles, 16-inch, gas, Oklahoma City area to St. Louis, planned.

Arkansas Industrial Pipeline Corp., Shreveport, 130 miles, 18-inch, gas, Perla-to-Helena, Ark., $9 million, planned.

Arkansas Louisiana Gas Co., Shreveport, 100 miles, 16-inch, gas, from near Clarksville-to-Jones Mill, between Malvern and Hot Springs, Ark., $6 million, construction underway, by Arkansas Louisiana Gas Co.

PROVED BY MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES & MILES



ON PIPELINES ALL OVER THE WORLD . . .

Perrault Pneumatic-Tired Lowering-in Cradles

- **Eliminates One Side-Boom and Leapfrogging of Tractors.**
- **Speeds Operation While Affording Protection to Pipe Coatings**

Perrault's Pneumatic-Tired Lowering-in Cradle consists of an adjustable frame with rubber guide rollers and truck tire conveyor rollers. Coated and wrapped pipe can be gently guided into the ditch while side-boom tractors move steadily along the line. Three sizes are available to fit pipes from 4" through 36". For complete details and a demonstration call LUther 5-1103 in Tulsa.

EVERY THING FOR THE PIPELINER!

Line Traveling and Stationary Coating and Wrapping Machines, Cleaning and Priming Machines, Pneumatic Clamps. Perrault-American Tar-Heating Kettles, Patchpots, Burners, parts and accessories. Esco Digging Teeth Pipe Protection Materials — Kraft, Asbestos Felt, Glass Wrap and Rock Shield. General Supplies—Hooks, Blocks, Line-Up Clamps, Sling Belts, Cradles, Hand Tools, materials, supplies and equipment of every sort . . . Everything for the Pipeliner.

PERRAULT Equipment CO., INC.

W. O. DIXON, Sole Owner

TELEPHONE LUther 5-1103 • 1130 NORTH BOSTON • TULSA 6, OKLAHOMA

EXPORT OFFICE: SUITE 2358, 45 ROCKEFELLER PLAZA, N.Y. 20 • PHONE PLaza 7-8265

Buckeye Pipe Line Company, New York, 70 miles, 8-inch, products, from Wayne to Flint, Michigan, planned.

Chicago District Pipeline Company, 5[illegible] miles, 30-36 inch, gas, from Natural Gas proposed line at Joliet to Chicago, $1[illegible] million, before FPC.

Cities Service Gas Company, Oklahoma City, 106 miles, gas, gathering, in Montgomery, Allen, Franklin, Miami, Johnson, and Wilson counties, Kansas, 3,600 hp to Blackwell station, Kay County, Kansas, FPC authorization.

Coastal States Gas Producing Co., Corpus Christi, Texas, 289 miles, 14 and 18-inch main line and gathering system, McAllen to Falfurrias, Tex., area, and Lopena to La Salle County, $12 million, contract let on 95 miles to O. R. Burden Construction Corp.

60 miles, small diameter, gas gathering line, to tie in with system under construction and extend to Pearsall County, Texas, planned.

Coastal Transmission Corp., Houston, 574 miles, 22-24 inch, gas, from McAllen, Texas to Baton Rouge, La. connection of Houston, Texas Gas and Oil plus 414 miles of laterals, $55 million, contracts let on compressor stations to Gasoline Plant Construction Corp. Contract let on main and laterals, to Oklahoma Contracting Co., and O. R. Burden Construction Corp., River Construction Corporation, Parson Company, Brown & Root, Buddy Sherrod, Inc.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, gas, Green River, Wyo.-to-Provo, Utah; 109 miles, 26-inch, Texas Panhandle to southeastern Colorado; 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, before FPC.

Conn-Mass Pipe Line, Inc., Orange, Conn., 88 miles, 8 inch, products, from Boston to Springfield, Mass., considered.

133 miles, 16-inch, products, from Linden, N. J. to Hartford, Conn., considered.

62.2 miles, 8-inch, products, from New Haven, Conn. to Springfield, Mass., considered.

38 miles, 6-inch, products, from Waltham, Mass. to Fitchburg, Mass., considered.

Consumers Power Co., 45 miles, gas, main line, from Woodbury station to Laingsburg Junction, Mich., planned.

126-miles, 26-inch, gas, main, Michigan-Indiana border to Plymouth, Mich., planned.

El Paso Natural Gas Company, El Paso, 216 miles, 26 to 34-inch main line, 533 miles, 6-20-inch laterals, gas, 86,750 compressor hp; 126 miles, 30-inch main line, 266 miles, laterals, gas, 28,920 compressor hp in new and existing stations in Arizona, New Mexico and Texas, contracts let on 819 miles to R. H. Fulton & Co., McVean & Barlow, Inc., Western Pipe Line, Inc., Eastern Pipeline Contractors, and Engineers Limited Pipeline Co.

Continued on Page 84

For more data on advertised products, use Readers' Service Cards, last page.

NEW, EXCLUSIVE DESIGN SUITS EVERY PIPELINE CONDITION TO A "T"

IT'S THE WmSON TYPE **T** PIG

New TRIANGLE design brushes* for more efficient and economical cleaning of all pipelines — *U. S. Pat. Pending

SEE OUR EXHIBIT

International Petroleum Exposition

MAY 14-23, 1959
Tulsa, Oklahoma

Williamson engineering has developed a new concept in pipeline pig design. This rugged, streamlined pig which is already widely used in gas, products and oil lines is available in sizes 12" and larger. Various engineered designs are available for traversing Gate Valves, Check Valves, Side Openings, Welding Ells, Miter Bends, etc.

- **EFFICIENT** — Exclusive triangle brush for full pipe coverage. (see photo at right)
- **LONGER LIFE** — Greater spring movement for increased cleaning life.
- **ECONOMICAL** — Increased mileage and ease of handling.

There's a "T" Pig Design for your pipeline . . . consult factory for specific recommendations.

Rear view of brushes partially inside pipe.

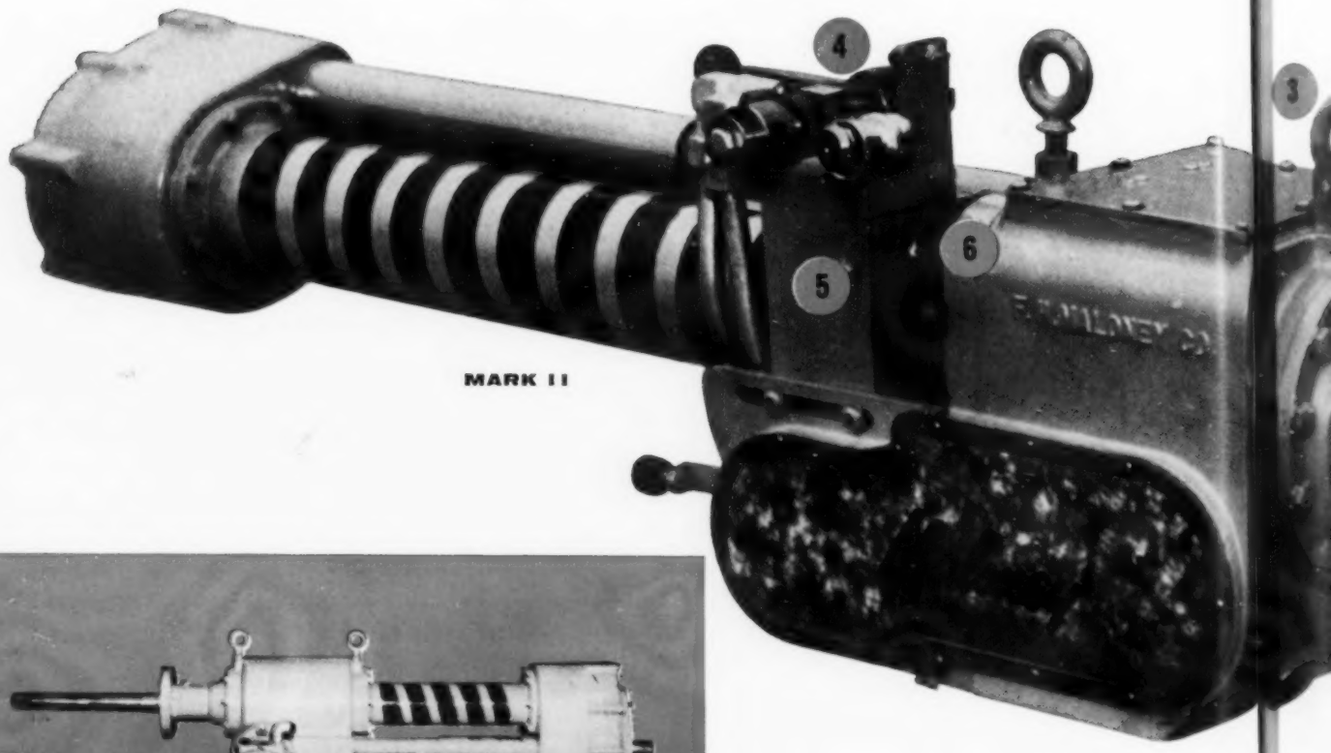
T. D. Williamson, Inc.
P. O. BOX 40 TULSA 2, OKLAHOMA

REPRESENTATIVES: HOUSTON • AMARILLO • PITTSBURGH • JOLIET, ILL. • LONG BEACH • SAN FRANCISCO • BARTLESVILLE, OKLA. • SEATTLE • SALT LAKE CITY • WEST MONROE, LA. • COLUMBUS, OHIO • EDMONTON • TORONTO • VANCOUVER • BUENOS AIRES • MONTERREY AND MEXICO CITY • CABIMAS, ZULIA, VENEZUELA • DURBAN, NATAL, S. AFRICA • PARIS • SYDNEY, AUSTRALIA • ROME, ITALY • MADRID, SPAIN • FRANKFURT MAIN, GERMANY

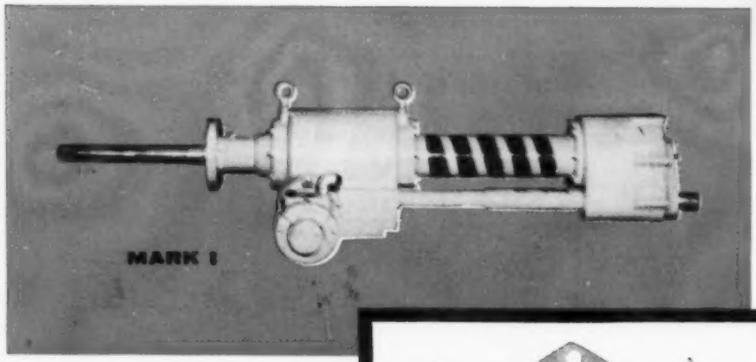
For more data on advertised products, use Readers' Service Cards, last page.

Completely NEW High-Pressure Pi

Over two years of intensive research and field testing have produced these all new high-pressure Tapping Machines. Conservatively rated at 1440 psi at 100° or 700 psi at 700°, the Maloney MARK I and MARK II incorporate every desired feature for rapid, safe, and accurate hot tapping, with complete power operation. Engineered and manufactured by the F. H. Maloney Company, completely within our own manufacturing facilities.

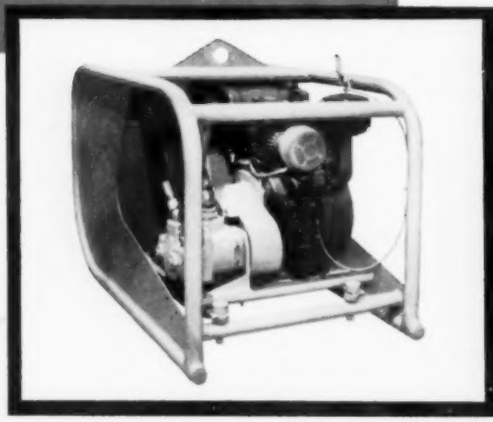


MARK II

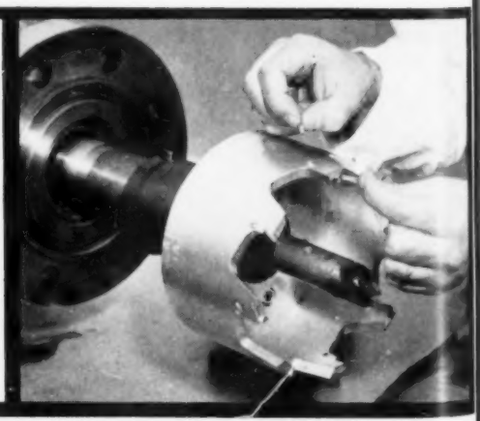


MARK I

Based on the same design as the MARK II, the MARK I covers the range of high pressure taps from 1 inch to 6 inch. Available with air motor or hand crank operation, the MARK I is rated at the same operating pressures and temperatures as the MARK II. Twist drill cutters are available to 3 inch, shell type cutters to 6 inch. (MARK I Air Requirements 90 psi, @ 105 cfm.)



Companion Hydraulic Power Unit powered with 9 hp gasoline engine, completely self-contained. Provides ample power and positive control of cutter torque with calibrated, infinitely variable, flow control. Available as an accessory with the MARK II. (MARK II Air Requirements — 90 psi, @ 105 cfm.)



Completely new shell cutter design — exclusively Maloney — provides instant field change of teeth, pilot, and cutter components *without* special tools or handling.

SEE OUR EXHIBIT

MAY 14-22, 1959
Tulsa, Oklahoma

Pipe Tapping Machines

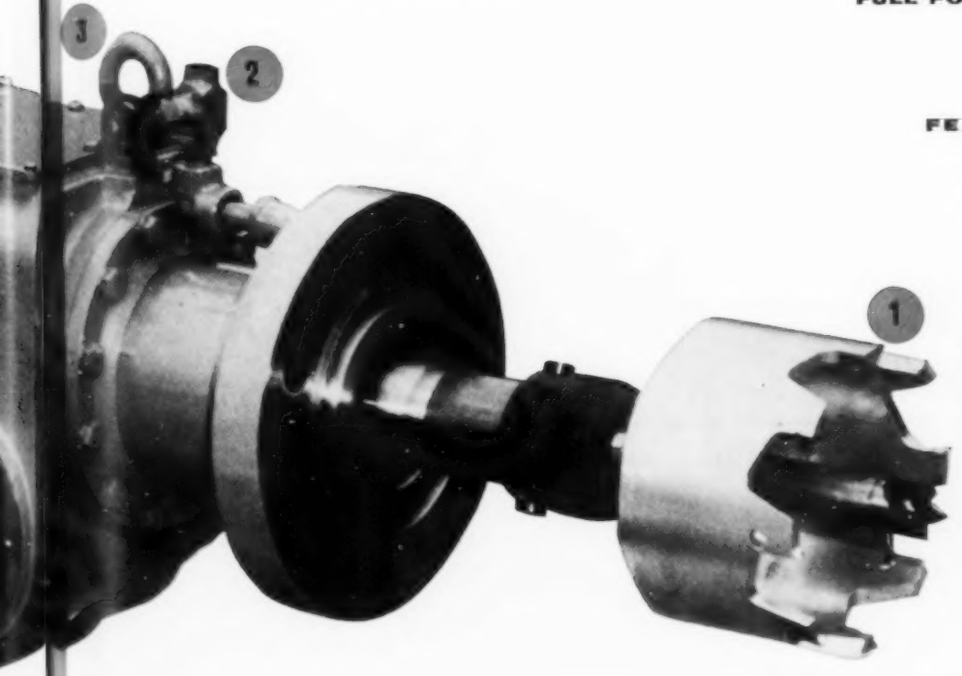
Maloney

MARK I

1 to 6 inch
air or hand crank

MARK II

4 to 16 inch
air or hydraulic
FULL POWER OPERATION



FEATURING

1. Revolutionary shell cutters provide cleaner cutting with less torque. Replaceable teeth, shell, and backplate for field maintenance.
2. Integral bleed-off valve.
3. Center of gravity well forward, near the cutting end of the machine, for easier handling. Vertical and horizontal operation with built-in lifting rings and bail.
4. Air or Hydraulic power (MARK II only), with ample reserve power. Completely reversible—makes the *full range* of cuts without alteration.
5. All operating controls grouped for simple operation.
6. Boring bar travel counter (MARK II only) measures travel in .01 inch increments. No guessing where the cutter is.
7. Simplified design eliminates unnecessary maintenance. Designed to be operated and maintained by *your* operating personnel.

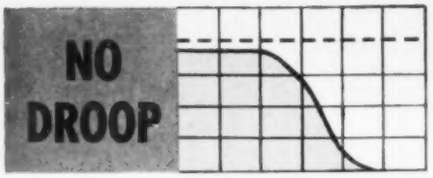
New
"Something From the Irishman"

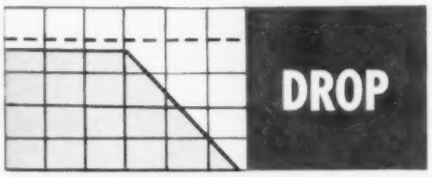
F. H. Maloney COMPANY

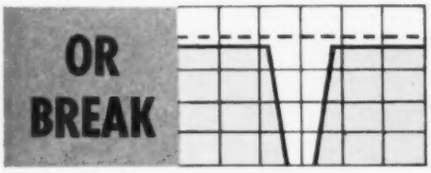
Post Office Box 1777 • Houston 1, Texas

CHICAGO • LOS ANGELES • PITTSBURGH • TULSA

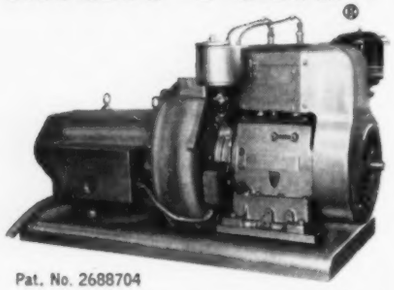
For more data on advertised products, use Readers' Service Cards, last page.







in Communications with U. S. MICRO-POWER®



Pat. No. 2688704

Your Insurance Policy for . . .

Stable Continuous Uninterrupted

Communications Power

Micro-Power operates *with* the main source of power. No time consuming "load transfers." No "power outages" *even for precious seconds!*

Micro-Power Units are available in 1500, 3000, 5000 and 10000 watt capacities. For complete information, specifications, and demonstration, write . . .

UNITED STATES MOTORS CORPORATION
LIGHT US POWER
OSHKOSH · WISCONSIN

U. S. MOTORS CORP.
102 W. 5th Avenue
OSHKOSH, WISCONSIN

See our operating Micro-Power exhibit, Space 202, North Area, at International Petroleum Exposition, Tulsa, May 14-23.

PROPOSED PIPE LINE CONSTRUCTION *continued*

400 miles, 34-inch, Salt Lake City, Utah, to California border, planned.

Equitable Gas Company, Pittsburgh, Penn., 11.7 miles of storage pipe line and other facilities, $2,091,430, authorized.

Gillette Pipeline Co., Cheyenne, Wyo., 103 miles, crude, from Dead Horse Creek field to Casper, Wyo., planned.

Great Northern Railway, St. Paul, 400-600 miles, 12-20 inch, crude, from Williston Basin to St. Paul-Minneapolis and Duluth-Superior areas, considered.

Columbia Gulf Transmission Co., Houston, 12.8 miles, 6 and 20-inch, gas, loop line in Louisiana, $730,000, authorized.

Gulf Pacific Pipe Line Company, 1,600 miles, 30-inch, gas, Louisiana to California border, considered.

Gulf Resources, New York, 125 miles, gas, gathering system, from Lopena area in Zapata County to a point in La Salle County, Texas, planned.

Humble Oil & Refining Company, Houston, 116 miles, gas, gathering various sizes, southwest Texas, planned.

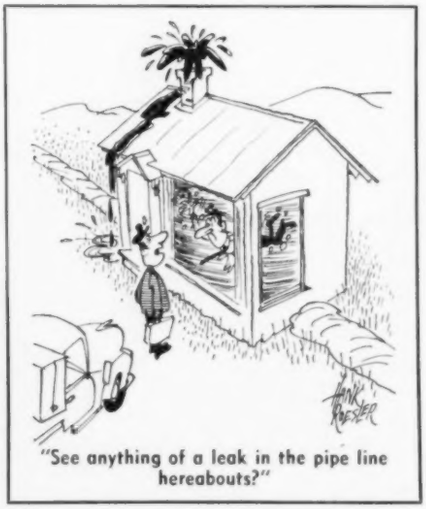
Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, before FPC.

Katy and New York Central Railroads, 2500-mile, 10-12 inch, LPG, from Houston, Texas, to New York, considered.

Manufacturers Light and Heat Co., Pittsburgh, Penn., 21-miles, gas facilities in Pennsylvania and West Virginia, $1 million authorized.

34-miles, 20-inch, in Greene, Adams, and York counties, Penn., authorized.

Michigan Consolidated Gas Company, Detroit, 53 miles, 30-inch, gas, loop, from Milford to Elsie, Mich., and 20,000 hp station at Edmore, Mich., 8,000 hp. at Woolfolk station, $15 million, planned.



"See anything of a leak in the pipe line hereabouts?"

Midwestern Gas Transmission Co., Houston, 350 miles, 30-inch, gas, Portland, Tenn. to Joliet, Ill., $50.8 million, before FPC.

New York State Natural Gas Co., Pittsburgh, 30 miles, 20-inch, gas, main, Silver Springs to East Elma, N. Y., $1.6 million, temporary FPC authorization.

43 miles, 20-inch, point west of Kittanning to Luthersburg, Penn, 14 miles, 26-inch, Little Marsh in Chatham Township to Boom station near Lawrenceville, Penn., and additional horsepower at Woodhull, Utica, N. Y., and Preston and Tonkin, Penn., contract let on 14 miles, 26-inch to Williams Bros. Co.

Northern Illinois Gas Company, 140 miles, 24-inch, gas, main line, East Dubuque to Des Plaines, Ill., planned.

Northern Natural Gas Co., Omaha, 167 miles, 20 inch, gas, from Farmington, Minn. to Duluth, Minn., and Superior, Wis., $12 million, before FPC.

42 miles, 10 inch, gas, from Rochester, Minn. to Winona and Goodview, Minn., $963,000, before FPC.

365 miles, gas, new facilities in Minn., Iowa, S. D., Neb., Wis., plus 1090 miles of branch line and station facilities, $65.7 million, authorization for a part. Gas facilities in Texas, Oklahoma and Kansas, $6 million, before FPC.

454 miles, main line loops and extensions, 6-30-inch, main line from St. Cloud, Minn., to Grand Forks, N. Dak., also 1,490 miles of branch lines, 2-10-inch, and station additions totaling 32,000 horsepower, $86 million, before FPC.

27.6 miles, 30-inch, gas, loop; 18.3 miles north of Beaver station in Okla., 9.3 miles north of Sunray station in Texas, $3 million, contracts let to R. H. Fulton & Co.

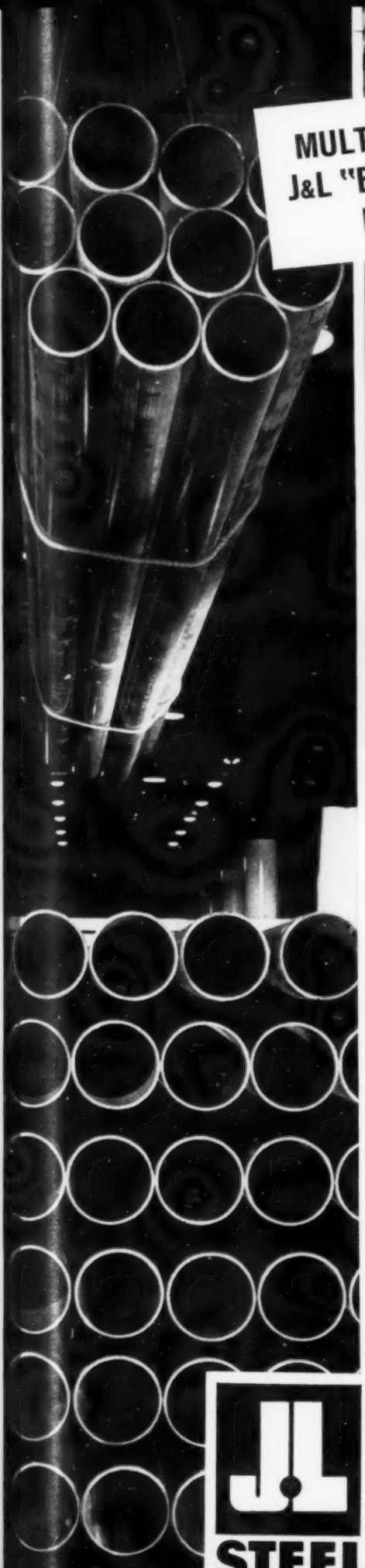
Northern Utilities Co., 35 miles, 16 inch, gas, in Fremont Natrona County, Wyo., area; 8 miles, 12 inch, around Casper; 6 miles, 8 inch, from Sand Draw gas field to Beaver Creek field; 12 miles, 6 inch, from Beaver Creek field to the system servicing the Riverton-Lander area, planned.

Ohio Fuel Gas Co., 51 miles, gas, main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingun, Stark and Wayne counties, Ohio, $2.2 million, authorized.

Natural gas storage field in Medina County, Ohio, 12 miles, 4½ to 20-inch gas, $5 million, authorized.

Pacific Gas & Electric Co., San Francisco 296 miles, 36-inch, gas, from Klamath Falls, Ore., to Antioch, Calif., southern section of line from Canada to California, before California Public Utilities Commission.

Continued on Page 88



MULTIPLE-TESTED J&L "ELECTRICWELD" LINE PIPE

J&L's 12¾-inch Electricweld line pipe was used in 22 miles of this Cherokee Pipe Line Company line.

"J&L Electricweld pipe bends readily to contours, is easy to weld"

. . . reports Pipe Line Service Company

Twenty-two miles of J&L's 12¾-inch O.D. Electricweld line pipe were installed by the Pipe Line Service Co., Seminole, Okla., in this line for the Cherokee Pipe Line Co.

"Our pipe must be uniformly round, bend readily to correct contour, and weld easily," says this pipeline contractor. "J&L pipe meets our specifications. It enabled us to avoid delays on this job over hilly terrain."

Electricweld line pipe is produced by Jones & Laughlin, an integrated steel company, under most rigid quality controls. Weld area of the steel is blasted with steel grit under 100 psi in a "Vacu-Blast" unit to clean the surface for perfect contact with the welding electrode.

During the electric resistance-welding process, electronic controls maintain exact welding heat at all speeds. After welding and trimming, pipe passes through an induction annealing unit to assure uniform grain structure in the weld area.

Every length of pipe is thoroughly checked through visual examinations, hydrostatic tests, flattening tests and magnaflux inspections. All Electricweld pipe is manufactured and tested in strict compliance with appropriate A.P.I. and A.S.T.M. specifications.

Electricweld pipe is available from 6⅝ inches through 12¾ inches and in lengths to 60 feet. Get the facts on this superior quality line pipe from your distributor, or write to Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

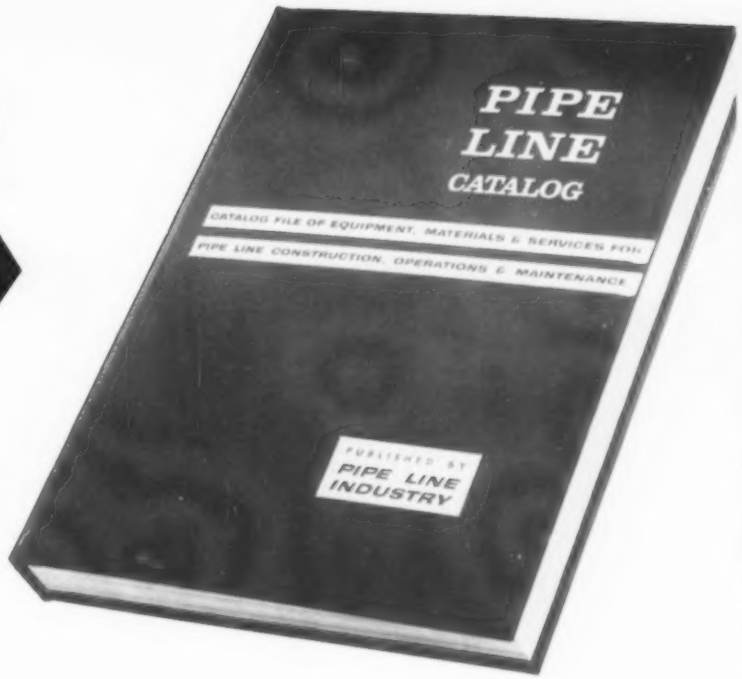
J&L STEEL

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

where's the WIDGET?

Here it is!

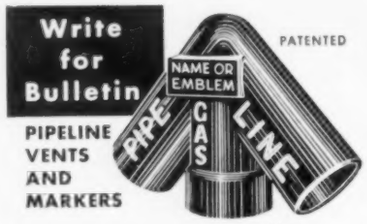


. . . along with over 11,000 other pipe line equipment and service items, cataloged, indexed and cross-referenced in the only comprehensive data file published specially for the pipe line industry PIPE LINE CATALOG is preferred 8-to-1 over individual company literature by the men who buy and specify in this market. That's why more than 165 suppliers and service organizations placed their complete or condensed catalogs in the current edition.

The next time *you* compare, buy or specify pipe line equipment or services, look *first* in PIPE LINE CATALOG. Chances are you'll save time and money.

PIPE LINE CATALOG

***Published by* PIPE LINE INDUSTRY**

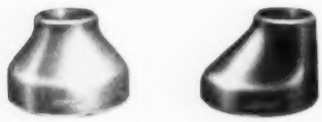


FLEET-LINE CO.
P. O. BOX 276-K
SHREVEPORT
LOUISIANA

Write for Specifications Folder

FLEET-LINE®
WELDING FITTINGS

REDUCERS: Concentric and eccentric. Nominal pipe sizes 1" to 30", ASA B16.9, ASTM A234. Schedules 10 to 160, stainless steel, and other alloys. Special lengths and sizes.



SADDLES: Conventional, and for pressure vessel heads. Nozzle sizes from ¼" to 24". Fleet-Line saddles weld neatly into place in much less time, and with much less welding rod.

Complete encirclement saddles.

Fast interested service.
Write for Literature.

STEEL FORGINGS, Inc.
P. O. Box 276K • Shreveport, La.

PROPOSED PIPE LINE CONSTRUCTION *continued*

Pacific Gas Transmission Co., San Francisco, 614 miles, 36-inch, Kingsgate B.C. to Klamath, Ore., northern section of Canada to California line, before FPC.

Pacific Lighting Gas Supply Co., 128-mile, 34-inch, gas, main line from Topock, Ariz. to Newberry, Calif., authorized.

Pacific Northwest Pipeline Corp., Salt Lake City, 235 miles gas, gathering lines in San Juan Basin, Garmesa, Piceance Creek, and Big Piney Fields, $13.5 million, planned.

65 miles, gas, sales laterals in Washington, $1.5 million, planned.

Pennsylvania Gas Co., Warren, Penn., 38 miles, 8 and 10 inch, gas, in Erie and Warren Counties, Penn., and Chautauqua County, N. Y., $2.6 million, authorized.

Piedmont Gas Co., Hickory, N. C., 78 miles, 2-8 inch, gas, from connection with Transcontinental Gas Pipe Line to serve customers in North Carolina, $2.6 million, authorized.

Pioneer Natural Gas Co., Amarillo, Texas, 62 miles, 10-inch main, Pampa, Texas, to Canyon, in Randall County, Texas, 20 miles, small diameter, gathering, 4,000 h.p. stations, $4.5 million, planned.

Phillips Petroleum Co., 25 miles, 6 to 20-inch, gas, South Eunice, New Mexico area, planned.

52 miles, 4 to 20-inch, gas, Gaines County, Texas, planned.

44-mile, 6-inch, products line, from Rocky pump stations to Amarillo, Texas, planned.

54 miles, 3-inch, gasoline, Crane County gasoline plant to plant near Ft. Stockton, Texas, contract let to Connor Construction Co.

Rio Gas Gathering Co., San Antonio, 97 miles, 3 to 8-inch, gas gathering, South Texas, to supply gas to El Paso Natural Gas Company, planned.

Southern California and Southern Counties Gas Cos., Los Angeles, 200 miles, 34-inch, from Nevada-California border to point near Fullerton, Calif., $44 million, before Public Utilities Commission.

Southern Kansas Pipe Line Co., Inc., Arkansas City, Kansas, 200 miles, 6-10 inch, crude, southwestern Kansas to Arkansas City, Kansas, planned.

Southern Natural Gas Company, Birmingham, 136 miles, 24 and 26 inch; 215 miles, various diameter supply lines; 3,650 additional compressor horsepower to White Castle and Toca Stations; 8 miles, 20-inch loops; 660 hp Franklinton station, and 23 measuring stations, $40 million, contracts let to William Brothers, Western Pipe Line, Inc., Brown & Root, Inc., and River Construction Corp. on 305 miles.

DEPENDABLE

equipment helps keep jobs on schedule. That's why you'll find SOMERVILLE crews are always well equipped for getting the job done.

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NORTHRUP GO-DEVILS & TRANSIT PIPE LINE SCRAPERS
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458 miles, 16-24-inch, loop lines, gas, between Gwinville, Miss., and Wrens, Ga.; 62 miles, 14-inch, loops, along Atlanta-Macon line; 53 miles, 6⅝ to 14-inch, loops, along various branch lines. 3,140 additional hp at Gallion and Elmore, Ala. and Wrens, Ga. 60 miles, 20-inch, loops, in Louisiana between Franklinton and White Castle and South of Toca. Lateral lines south of Gwinville and west to Cranfield field. 8,720 hp added at Franklinton, White Castle, Patterson and Brookhaven, $65 million, contracts let to River Construction Corp., H. C. Price, Latex Construction Co., and Houston Contracting Co. on 355 miles.

Tennessee Gas Transmission Co., Houston, 21 miles, 16-inch, 2 miles, 12¾-inch, gas, Louisiana coast, Vermillion, Blocks 46 and 64, $2.9 million, before FPC.

158 miles, 36-inch, looping system in Louisiana and Mississippi, to supply Midwestern additional gas at Portland, Tenn. $61.4 million, before FPC.

Texas Eastern-Penn-Jersey Transmission Corp., Shreveport, La., 65 miles, gas, from Delmont, Penn., to Lambertville, N. J., before FPC.

24,000 compressor hp additions to existing stations, $4.4 million, temporary FPC authorization.

4,000 horsepower to its Delmont, Penn., compressor station, five new compressor stations in Pennsylvania with total capacity of 67,000 hp, $11.2 million, authorized.

Texas Eastern Transmission Corp., Shreveport, La., 267 miles, 14-30 inch, gas, Louisiana, Mississippi, Pennsylvania and New Jersey, $50 million, before FPC.

96.5 miles, 30-inch, gas, between Kosciusko, Miss., and Uniontown, Penn.; 9.4 miles of supply laterals; a 10,250 hp compressor station, and 33,360 hp to existing compressor stations, $24.5 million, authorized.

141,780 additional horsepower in existing stations, a new 2,200 hp compressor station, in Louisiana, Mississippi, Pennsylvania, Ohio, Kentucky and Tennessee, authorized.

Texas Gas Gathering Corp., Shreveport, 36.6 miles, gas, gathering system in Rodney Field, Jefferson County, Miss. and from North and South Locust Ridge, Lake St. John Field in Tensas and Concordia parishes, La., $855,413, before FPC.

Texas Gas Transmission Corporation, Owensboro, Ky., 92 miles, 30-inch, 19 miles, 26-inch, and 15 miles, small diameter, loop portions of system in Louisiana, Arkansas, Mississippi, Kentucky, Indiana and Illinois; additional horsepower at Pineville, La., Kenton, Tenn., Calvert City, Ky., Slaughters, Ky., Dillsboro, Ind., and Petersburg, Ind., totaling 9,040 hp. $20 million, contract let on 72 miles to Houston Contracting Co.

246 miles, 26-30-inch, loops, between Eunice, La., and Lebanon, Ohio, 102 miles, supply lines, south Louisiana, and addition of 15,760 hp, $40 million, before FPC.

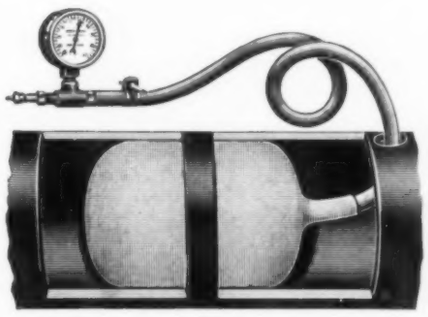
Texas Illinois Gas Pipeline Company, Chicago, 16,000 additional hp to stations at Lufkin, and Marshall, Texas; Texarkana, Malvern, Searcy, and Biggers, Ark.; Jackson, Mo.; and Hammond, Ill., $3.9 million, before FPC.

Transcontinental Gas Pipe Line Corp., Houston, 204 miles, 36-inch, 107 miles, 30-inch, main line loops in 10 states; 3 intermediate stations: North Carolina, Virginia, Pennsylvania; 2,500 additional hp at six compressor stations; 164 miles, 24-inch from Leidy storage Penn.; 29 miles, 30-inch, New Jersey; gathering lines, Louisiana, 119 miles; 10 meter stations; additions to West Cameron and High Island area, 35-miles, 16-inch, 26 miles, 10-inch, and three gathering meter stations; 45 miles, 16-inch, purchase laterals and 5 meter stations, Louisiana; 67 miles, 10, 12, 20-inch miscellaneous transmission purchase laterals in Texas and Louisiana, 3 meter stations; 51 miles, 36-inch and 1 mile, 30-inch in New Jersey; 51 miles, 10- and 14-inch and 3 meter stations, southeast Louisiana (mainly offshore), $137.3 million. Contracts let on 710 miles to Bechtel Corp., Sharman, Allen, Gay & Taylor, Panama Williams, J. P.

Continued on Page 90

PIPELINE INFLATABLE STOPPERS

BALLOON-TYPE



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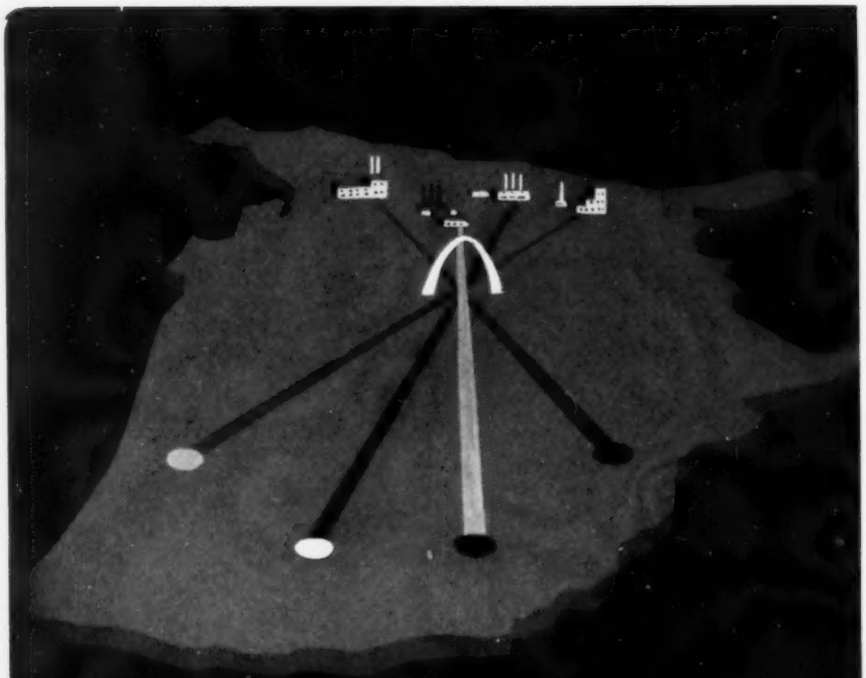

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PROPOSED CONSTRUCTION

continued

Neill, H. C. Price, Brown & Root, Hallmac Construction Co. and Glaser Construction Company.

151 miles, 24-inch, 12 meter stations, southeast Louisiana, $14.5, authorized.

2,500 additional hp at four compressor stations, St. Francisville, La.; Laurel, Miss.; Linden, Ala. and Wadley, Ala., $3 million, authorized.

Wells, pipe lines, measuring equipment, stations at Leidy storage in Pennsylvania, $12.5 million, authorized.

149 miles, 36-inch, main loops, 34 miles, 20, 24-inch gathering, compressor stations at Neuces County, Texas and St. Helena Parish, La., additional hp in eight stations, $51 million, before FPC.

Trans-Utah Pipeline, 120 miles, 16-inch, gas main line from Uinta Basin to Salt Lake City, considered.

Transwestern Pipeline Company, Houston, 1,305 miles, 24- and 30-inch, gas, main line, from West Texas and Oklahoma-Texas Panhandle area to Topock, Ariz., $193 million, before FPC.

Trunkline Gas Company, Houston, 204 miles, 26-inch, gas, main line from Tuscola, Ill., to Michigan-Indiana border; 464 miles, 30-inch loops between Longville, La., and Tuscola and 45 miles, 24-inch, in Texas, 183 miles gathering, Louisiana, 3000 additional hp at Longville station, $81.5 million, before FPC.

Underground Storage & Exploration, Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million, approved.

95 miles, 6-8 inch, laterals to Mauch Chunk, Penn., and to Philadelphia, planned.

United Gas Pipe Line Co., Shreveport, La., 203 miles, 30-inch, gas, between New Orleans and Mobile, Ala., $33.7 million, contracts let on 30-miles to O. R. Burden, 38 miles to Williams Bros., 12 miles to Western Pipe Line, Inc., 30 miles to Hallmac Construction Co., and 41 miles to Houston Contracting Co.

Valley Gas Transmission, Inc., Houston, 160 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells Counties, Texas, $15 million, before FPC.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. government.

Alaska-Yukon Refiners and Distributors, Ltd., Edmonton, Alta., 150 miles, products, serving Alaska and Yukon territory, $3.5 million, planned.

Alberta Natural Gas Company (Jointly owned by Westcoast Transmission Co. and Alberta & Southern Gas Co. Ltd.) 36-inch, gas, Alberta border to British Columbia-Idaho border, supply gas to Pacific Gas & Electric Co., $40 million, planned.

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

Continued on Page 92

UNICOR®-LHS

Highest Detergent Activity in an Anti-Icing Agent

The three photos on the right were taken of glass throttle bodies at the conclusion of a carburetor cleanliness test in which the additives, at low anti-icing dosages, were compared on an equal cost basis.

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Convenient and economical to use, this anti-icing additive can be introduced anywhere—refinery, bulk plant or filling station—at less than half the cost of ordinary anti-icers.

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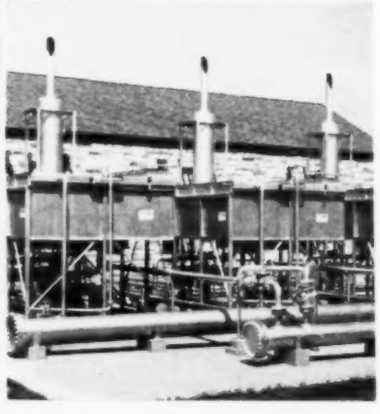

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PROPOSED CONSTRUCTION

continued

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, India, planned.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Colombian Petroleum Company, 68 miles, 12-inch, crude, Cicuco field to Covenas, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Development and Resources Corp., 70 miles, 8 inch, gas, from Agha Jari oil field to Ahwaz, Iran, planned.

Entre Nazionali Idrocarburi, Rome, Italy, crude, from Qum field in Iran to the Mediterranean Sea, considered.

Foothills Pipe Line, Ltd., 500 miles, 12 to 16-inch, LPG, from Alberta to Pacific Coast, $80 million, considered.

Hydrocarbons Pipeline, Ltd., Winnipeg, Manitoba, 880 miles, 6-8 inch, products, from Edmonton to Winnipeg, $35 million, partial authorization.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $395 million, before Borden Commission.

Interprovincial Pipe Line Company, 350-mile extension from Toronto to Montreal, looping line from Edmonton to Toronto, crude, $240 million, considered.

6,150 hp pump station at Iron River, Mich., and 4,450 hp addition at Edmonton, Alta., $2 million, planned.

Iraq Petroleum Company, 80 miles, 30-32-inch, crude, loop line, Rumaila field to Fao, Iraq, planned.

Island Transmission Company Limited, Nanaimo, B.C., 25 miles, 10-inch, gas, from point near Vancouver, B.C. to Vancouver Island, 67 miles, 10-inch, laterals to Victoria and Nanaimo, B.C., $14 million, planned.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

NATO, 211 miles, crude, 6-inch, between Malatya-Cetinkaya-Erzincan, Turkey, $6 million, bids asked.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran, $5 million, planned.

1000 miles, 38 inch, crude, from central Iran to the Turkish Mediterranean coast, considered.

Peace River Oil Pipe Line Co., Ltd., 70-mile, crude, Swan Hills to Iosegun Junction, approved.

Pembina Pipe Line, Ltd., Edmonton, 1,200 miles, LPG, from Alberta gas fields to eastern Canada, planned.

Petroleos Mexicanos, 38 miles, 4 inch, products, from Mexico City to Toluca, $500,000 planned.

Concluded on Page 96

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Yes, you too can avoid annoying, costly delays on any job — anytime — anywhere — by using rugged Crose pipeline construction equipment. Crose offers the most complete line . . . has many strategic supply points . . . and unmatched field service. There's more profit in the job for you by always using Crose equipment.

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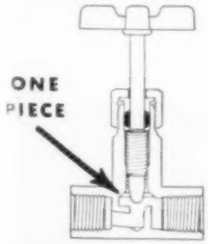

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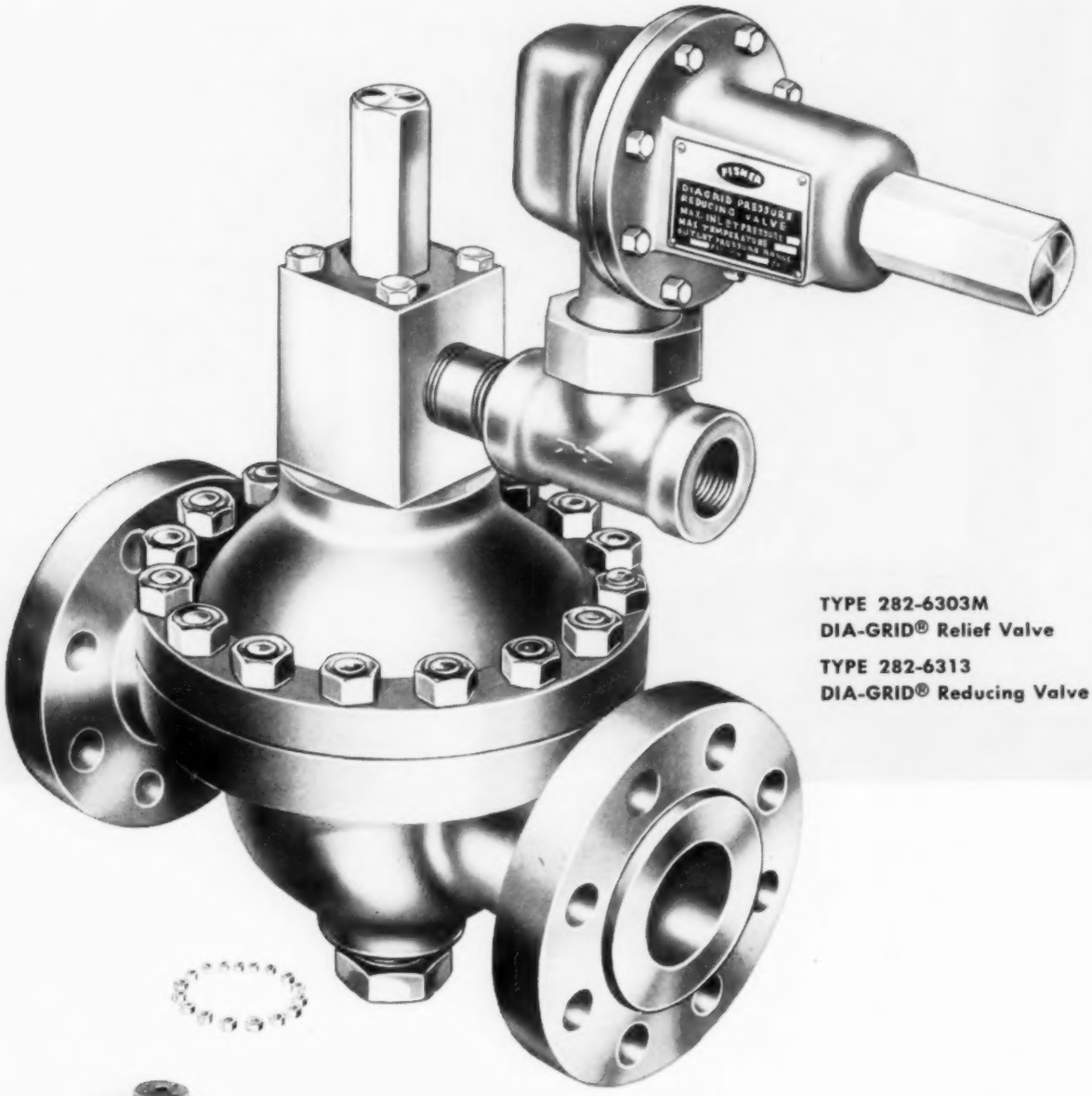

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DIA-GRID® Relief Valve

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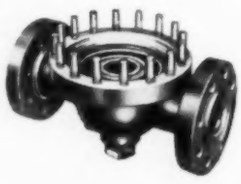

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Body does not have to be removed from line to inspect or replace internal parts.

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TYPE 282
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For Pressure Relief or Reducing Service

- **LARGE CAPACITY**—will equal or exceed capacity on conventional single port body.
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Controls High Pressure Drop with Dead-tight Shut-off from zero to full flow...quietly

Whenever there is a need for a large capacity positive shut-off valve that is simple, dependable and accurate, the Fisher Type 282 is the answer.

In fact, the 282 is more than a relief valve. With a choice of available pilots, the main valve becomes an efficient back pressure valve or a reducing valve, each having the basic advantages characteristic of the main body.

Regardless of its function, the main valve is basic simplicity, it has only one moving part—an expansible element which flexes to open and close the valve. Numerous bubble tests, made on all sizes, conclusively prove leak-tight design. No hunting or cycling occurs at any pressure setting. Its ability to relieve holds within ±1 psi.

Designed primarily for gas service, the Dia-Grid 282 can be used on liquid service wherever air or gas is available as a pilot operating medium.

BODY CONSTRUCTION

Sizes—2" and 4" flanged in iron or steel; 6" and 8" flanged steel
Grid—Stainless steel
Expansible Element—Two elements available—one for temperatures between 15 to 150° F., other for temperatures between −40° to 120° F. The flexibility and simplicity of the Dia-Grid is enhanced with the wide range of pilots that are interchangeable on the same main valve body.

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Pilot Type	**Relief Pressure Range**	**Pilot Type**	**Outlet Pressure Range***
6302	30 to 125 psi		
6303L	30 to 75 psi 75 to 150 psi	6310L	5 to 50 psi
		6310H	50 to 200 psi
6303M	70 to 150 psi 140 to 300 psi	6313	20 to 100 psi

**30 psi minimum pressure drop—300 psi maximum pressure drop.*

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PROPOSED CONSTRUCTION

continued

126 miles, 4, 6 and 8 inch, products from Mexico City to Cuernavaca and Puebla, $2.5 million, planned.

214 miles, products, Monterrey to Torreon, $6.5 million, planned.

Pipelines of Puerto Rico, Inc., 95 miles 8-inch, products, Penuelas to San Juan Puerto Rico, planned.

Saskatchewan Power Corp., 52 miles, 6 inch and 24 miles, 4-inch, gas, from St. Louis to Tisdale, 79 miles, 10-inch gas, Success to Rosetown, and 11 miles, 8-inch, gas, from Regina to Yorktown, bids asked.

Sociedad Nacional de Oleoductor, 75 miles, crude, from Santiago-to-Valparaiso, $3 million, planned.

Societa Nazionale Metanodotti, 250 miles, 18-inch, crude and products, Genoa to Milan-Cremona-Torino, Italy, and Geneva, Switzerland, considered.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Trans-Canada Pipe Lines Limited, Toronto, compressor stations at Ignace, Geraldton and Hearst, Northern Ontario, and Maple, north of Toronto, $15.5 million, planned.

Trans-Europe Pipe Line, 700 miles, 30 inch, main trunk, crude, from Mediterranean to northern Europe, considered.

Trans-Prairie Pipelines, Ltd., Edmonton, crude line, from Weyburn field to Regina-Moose Jaw areas, $5 million, considered.

Union Gas Company of Canada Limited, 45 miles, 8-inch, gas, main, Stratford to Goderich, Ontario; 10-miles, 8-inch, main, to Amhertburg; 10-miles, 12-inch, lateral, Galt to Brantford, planned.

Westcoast Transmission Company, Ltd., 174 miles, 30-inch, gas, Savanna Creek gas field, Alberta, to British Columbian border, $45 million, planned.

Williams-McWilliams Industries, Inc., New York, 441 miles, 6-inch, crude, Villa Montes, Bolivia to Villa Hayes, Paraguay, considered.

Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina, 621 miles, 12-inch products, Mendoza to San Lorenzo, Argentina, $19 million, planned.

281 miles, 12¾ inch, crude, Pichana to San Miguel Tucuman to Techint S. A., planned.

450 miles, 16-inch, crude, from Neuquen Province to Bahia Blanca, planned

Model TBR-3

Model TBR-5 — Also available in 10-gal. size Model TBR-10

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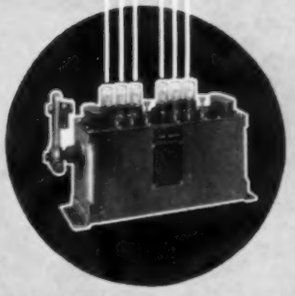

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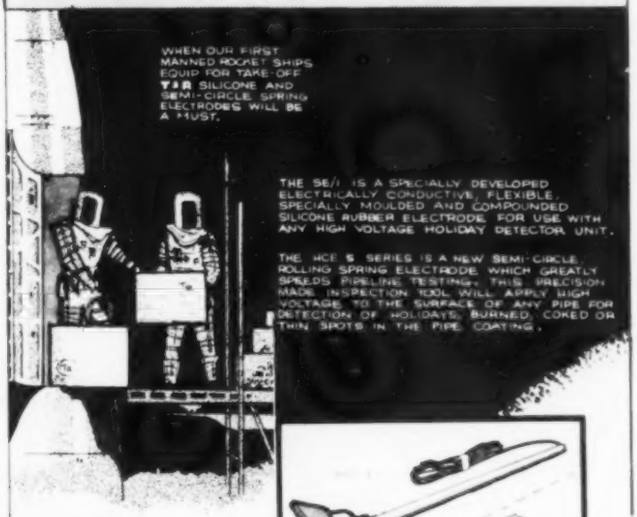
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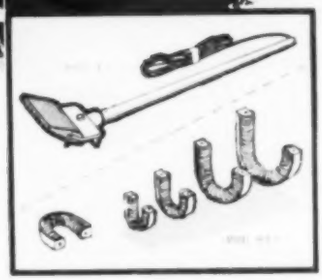
THE SE/1 IS A SPECIALLY DEVELOPED ELECTRICALLY CONDUCTIVE, FLEXIBLE, SPECIALLY MOULDED AND COMPOUNDED SILICONE RUBBER ELECTRODE FOR USE WITH ANY HIGH VOLTAGE HOLIDAY DETECTOR UNIT.
THE HCE 5 SERIES IS A NEW SEMI-CIRCLE ROLLING SPRING ELECTRODE WHICH GREATLY SPEEDS PIPELINE TESTING. THIS PRECISION MADE INSPECTION TOOL WILL APPLY HIGH VOLTAGE TO THE SURFACE OF ANY PIPE FOR DETECTION OF HOLIDAYS, BURNED, COKED OR THIN SPOTS IN THE PIPE COATING.



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For More Dependable Equipment and Service

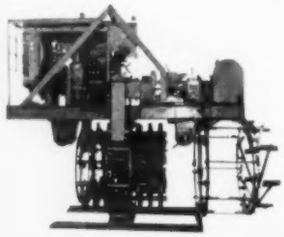
Specify

MYOCO

CLEANING and PRIMING MACHINE

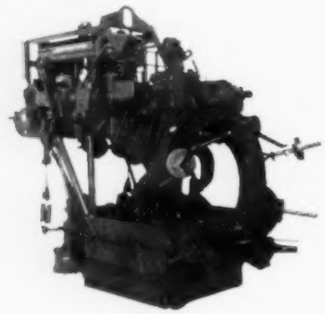
The MYOCO Cleaning and Priming Machines are available in sizes 3" thru 36". Pictured here is the 26"-32" size with two counter-rotating heads featuring the special MYOCO design counter-rotating gear box.

It is powered by an International U-9 self-starting engine and uses the Ramsey transmission. Engine exhaust is utilized to heat primer tank.



COATING and WRAPPING MACHINE

The MYOCO Coating and Wrapping Machine is powered by an International gasoline engine, with electric starter, spray type shoes, and heavy-duty transmissions and clutches. This new machine features under-pressure-crawler wheels equipped with hydraulic cylinder to maintain positive contact, easily controlled by the operator.



When you use MYOCO pipeline equipment, you quickly find that servicemen are experienced and available twenty-four hours a day with fast transportation available to serve you in any way; efficient equipment operation is assured by periodical checks; and if possible, parts and supplies are shipped the same day ordered.

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

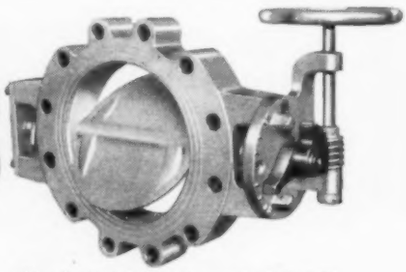
Engineering Editor Wanted

WE'RE LOOKING for a certain fellow on the sunny side of 40. You'd consider him a personable sort, though he doesn't flash his dentures at the drop of a pun. He's got a lively curiosity, likes to travel, and he likes people. He went to college . . . studied engineering . . . but he didn't stay there so long he became a campus institution. Someone who has some pipe line experience. He has a nodding acquaintance with a typewriter. Not necessarily a polished writer, you understand. Just a fellow who can put one word after another and come up with something a pipeliner will like to read.

Have you seen this fellow? Well, if you happen to run across him, tell him to get in touch with Mel Judah, the foreman on this spread. Mel wants to offer him a job. The complete name and address is Melvin A. Judah, Editor, PIPE LINE INDUSTRY, PO Box 2608, Houston 1.

ROCKWELL

"WAFER" VALVES

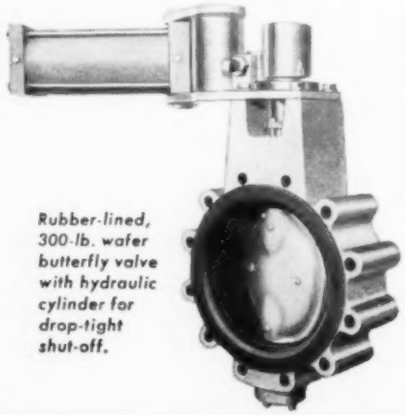


Standard 125-150 lb. wafer butterfly valve with handwheel; also available with lever control or mechanical operators.

- *LOWER IN FIRST COST*
- *NEED MINIMUM SPACE*
- *EASY TO OPERATE*

For controlled throttling or tight shut-off of air, gases, process fluids or semi-solids, Rockwell Wafer Butterfly Valves offer the advantages of rugged construction, compactness, small face-to-face dimension to fit in minimum clearance between pipe flanges.

Write for Bulletin 580.



Rubber-lined, 300-lb. wafer butterfly valve with hydraulic cylinder for drop-tight shut-off.

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY

Valves—Butterfly · Slide · Diaphragm · Special

2729 ELIOT STREET • FAIRFIELD, CONN.

Who Discovers the Discoverers?

"A professor can never better distinguish himself in his work than by encouraging a clever pupil, for the true discoverers are among them, as comets amongst the stars." CARL LINNAEUS

Somewhere in this mighty land of ours, a gifted youth is learning to see the light of tomorrow. Somewhere, in a college classroom or laboratory, a dedicated teacher is gently leading genius toward goals of lofty attainment. Somewhere the mind of a future discoverer—in science, engineering, government, or the arts—is being trained to transcend the commonplace.

Our nation has been richly rewarded by the quality of thought nurtured in our colleges and universities. The caliber of learning generated there has been responsible in no small part for our American way of life. To our college teachers, the selfless men and women who inspire our priceless human resources, we owe more than we will ever be able to repay.

Yet how are we actually treating these dedicated people? Today low salaries are not only driving gifted teachers into other fields, but are steadily reducing the number of qualified people who choose college teaching as a career. At the same time, classrooms are beginning to get overcrowded. In the face of this, college applications are expected to double by 1967.

This is a severe threat to our system of education, to our way of life, even to our very existence as a nation. Our colleges need help—and they need it now!

HIGHER EDUCATION
KEEP IT BRIGHT

If you want to know more about what the college crisis means to you, and what you can do to help, write for a free booklet to: HIGHER EDUCATION, Box 36, Times Square Station, New York 36, New York.

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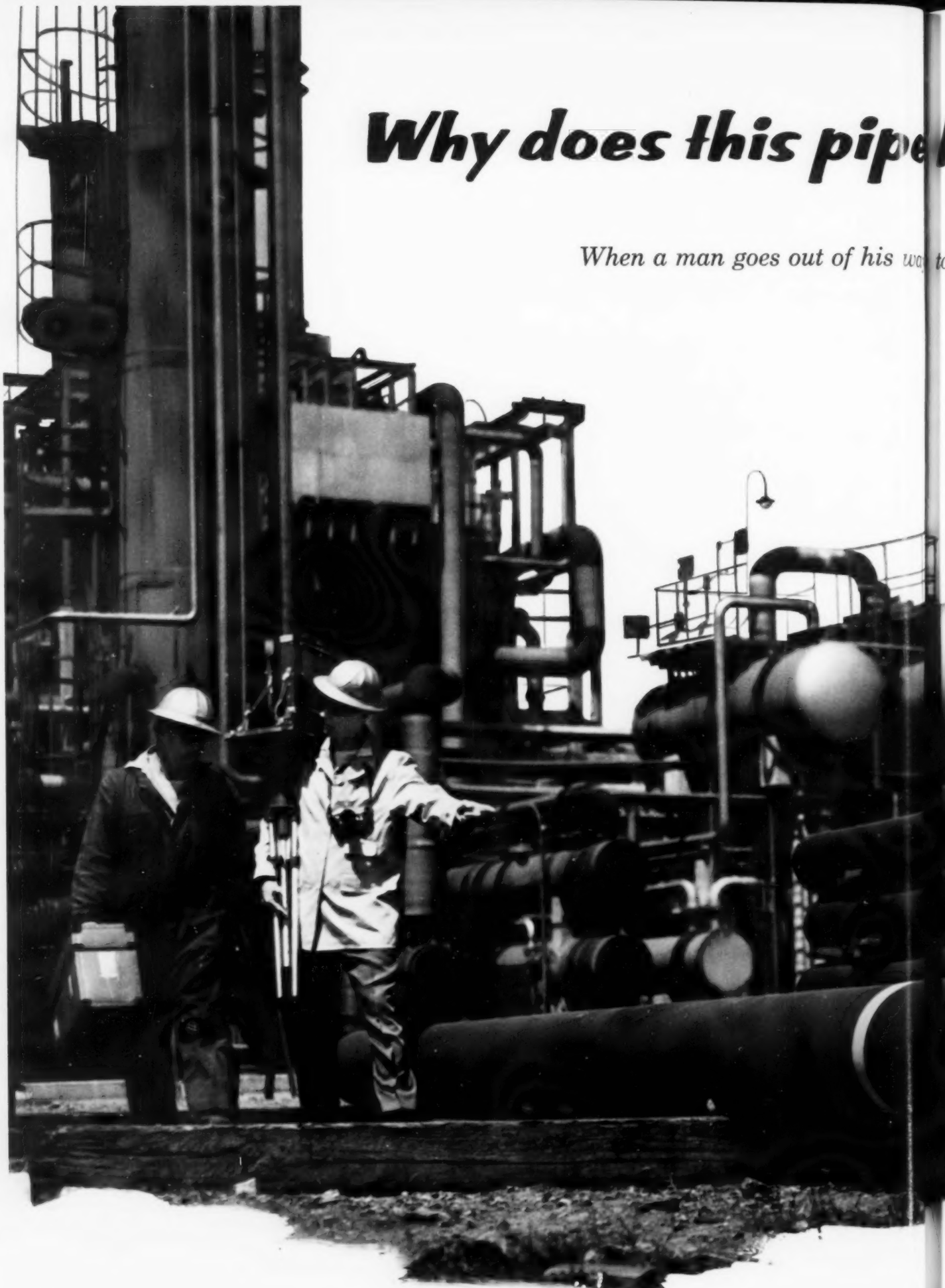
Why does this pipe h

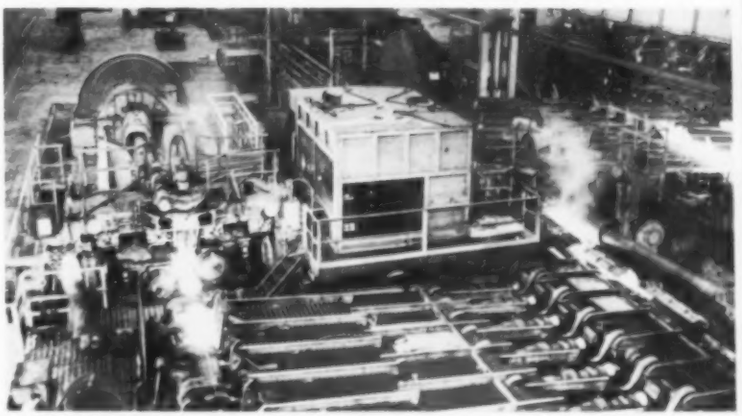
When a man goes out of his wa to n



...e have an Orange Band?

...w... to make a superior product...

he likes to brand it. This lets people know the quality they're getting. The orange band marks Youngstown seamless line pipe . . . the finest made. This high-strength, uniform quality seamless pipe is furnished with ends threaded, grooved, or plain end bevelled for welding and for various mechanical couplers. To obtain more information about Youngstown Line Pipe, contact our sales and service offices throughout the oil and gas-producing country. *The Youngstown Sheet and Tube Company, Youngstown 1, Ohio.*



Youngstown's ultra-modern, fully-automated No. 3 Seamless Mill—now operating at our Indiana Harbor Works near Chicago—produces the pipe with the orange bands, the finest made anywhere. Illustrated is the piercing operation at which point a hole is formed in the middle of a solid round steel billet. This is an important step in the making of seamless line pipe . . . one of many accurate Youngstown operations that build quality and dependability into the pipe with the orange bands.

QUALITY YOUNGSTOWN SERVICE

Youngstown

SEAMLESS LINE PIPE

In the U.S.A. for the First Time

A Panorama of New Ideas That Can Be Put to Work For You!

All Under One Roof. New York's massive air-conditioned Coliseum is ideally equipped to comfortably accommodate this world-wide event.

To help *you* meet today's needs and prepare for tomorrow's problems, more than 275 major companies from this country and abroad will present the latest materials and equipment, improved and entirely new processes, the most modern techniques, plus nuclear energy applications for use in the petroleum and petrochemical industries.

It's an important opportunity for you to learn the latest developments affecting your industry, to stimulate fresh, new ideas, and benefit from the exchange of information with thousands of the world's leading oil executives, engineers and scientists.

Plan now to attend...and bring your key men with you. Just one idea picked up here will make their visit worthwhile. For advance registration and hotel information write the Exposition at 480 Lexington Avenue, New York 17, N. Y.

5th

WORLD PETROLEUM CONGRESS EXPOSITION

New York Coliseum June 1-5, 1959

Management: International Exposition Co.

What's Happening

among MEN in the INDUSTRY

J. J. Donda

J. W. Prickett

John W. Prickett has been named manager of public relations of **Natural Gas Pipeline Company of America** and its affiliates, succeeding **Robert H. Lewis. James F. Miller** was appointed manager of employe relations and **Jerry J. Donda,** assistant editor of *Between the Lines*, has been named editor.

J. F. Miller

Prickett had been editor of *Between the Lines* since joining NGPL in 1954. Miller has been with the company since 1951 and has been acting manager of employe relations since 1958. Donda joined NGPL in 1956.

David Packard has been elected a member of the board of directors of **Pacific Gas & Electric Company.**

Packard is the co-founder and president of Hewlett-Packard Company, engaged in research and manufacturer of electronic equipment. He is president of the board of trustees of Stanford University and a director of Crocker-Anglo National Bank.

The **Bolivian Petroleum Institute,** a society whose activities are devoted to technical and scientific fields, has been formed.

Alfonso Romero L., general manager of YPFB, has been named president; **Benjamin Hake,** general manager of **Bolivian Gulf** is the vice president; **Enrique Mariaca B.,** assistant to the general manager of YPFB, has been elected secretary and **Miguel Tejada,** chief of reservoir engineering at YPFB, is the treasurer.

Several promotions have been announced by **Northern Natural Gas Company. Paul Acord,** secretary department, has been made supervisor of the corporate regulation and contract section; **Dave Bowman,** secretary department, has been promoted to supervisor of land and property section; **Richard DeVries,** gas supply, becomes gas storage engineer in the underground storage section of gas supply; **Charles McConkle,** engineering, has been named engineer; **Jack Osborne,** legal department, has been promoted to senior attorney; and **John Scoville** has been named assistant superintendent of the Spearman gasoline and dehydration plant.

A. C. Nelson has been named superintendent of operations and **E. Y. Ayash** has been promoted to chief oil dispatcher for **Trans-Arabian Pipe Line Company.**

Nelson joined the company in 1948 as a corrosion engineer and was made chief oil dispatcher in 1950. Prior to his association with Trans-Arabian he had been with Pure Oil Company, Southeastern Pipe Line Company, and the Plantation Pipe Line Company.

Ayash has been with Tapline since 1947, when he was named a construction engineer. He was transferred to the oil dispatching section in 1950 and for the past four years he had been assistant chief oil dispatcher.

Harold Burrow

Charles W. Hamilton

Tennessee Gas Transmission has announced that three Houstonians were recently named to the company's board of directors while a fourth resigned as director and became the firm's first director-emeritus. The new directors are: **Harold Burrow,** executive vice president of the company; **Charles W. Hamilton,** senior vice president and trust officer of the **National Bank of Commerce,** and **H. Malcolm Lovett,** senior member of the law firm of **Baker, Botts, Andrews and Shepherd.** The new director-emeritus is **A. Dee Simpson,** honorary chairman of the **National Bank of Commerce.**

H. Malcom Lovett

Oakite ECP...

Do your pipelines suffer from hardening of the arteries?

Pipelines lined with scale and sludge act just like hardened arteries – impeding circulation, increasing the necessary pumping effort.

With pipelines, fortunately, there's a quick remedy. Full efficiency can be restored through cleaning by chemical circulation, using Oakite methods and materials ... getting the benefit of Oakite ECP.

What's ECP? It's an Engineered Cleaning Program that takes into account your own individual soil problems, your requirements, your equipment. The Oakite Engineer lends personal and experienced supervision to the program, insures that the job is done at lowest possible cost.

Call your local Oakite man now. There's no obligation, of course. Meanwhile, for more information, write to Oakite Products, Inc., 51A Rector St., New York 6, N.Y.

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OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

in our 50th year

Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

General Gas Corporation announces the election of **Clement A. Evans,** investment banker, to the board of directors. President of Clement A. Evans & Co., Inc., Evans serves on the board of governors of the Investment Bankers Association of America.

C. A. Evans

He is a member of the board of directors of Georgia Marble Company, Fulton Investment Company, Gladwin Plastics, Inc., and Phoenix Investment Company.

Northern Natural Gas Company has elected **Peter Kiewit** a member of the board of directors.

He is president of Peter Kiewit Sons, Inc. Other directorships held by Kiewit include the Omaha National Bank and Northwestern Bell Telephone Company.

Chester L. May has been named a director of **Rio Grande Valley Gas Company** succeeding the late **O. P. Wilson,** former board chairman.

May is a former senior vice president and director of Lone Star Gas Company. He retired in 1958 after 40 years of service. He has served in various executive capacities with the American Gas Association and Southern Gas Association.

L. T. Potter, president of **Lone Star Gas Company,** has been named to the board of directors of the Lone Star Steel Company to fill the position vacated by the late **W. C. Windsor.**

DEATHS

G. F. Brunston, 59, retired vice president of Colorado Interstate Gas Company, died of a heart attack March 1. Brunston, who had been vice president in charge of transmission since 1951, had been in the pipe line industry since 1926. He was assigned project engineer for Colorado Interstate's original line from Amarillo, Texas, to Denver. He became chief engineer in 1928, assistant general superintendent in 1942, general superintendent in 1945 and vice president in 1951.

Francis V. Maloney, 52, Shell Pipe Line Corporation died February 22, after a brief illness. He had been a supervisor for the company the past six years. Maloney was affiliated with Shell for 36 years starting as an office boy 23 years ago.

H. T. Gross, 58, vice president of Arkansas Fuel Oil Corporation, died of a heart attack at his home in Shreveport, February 10.

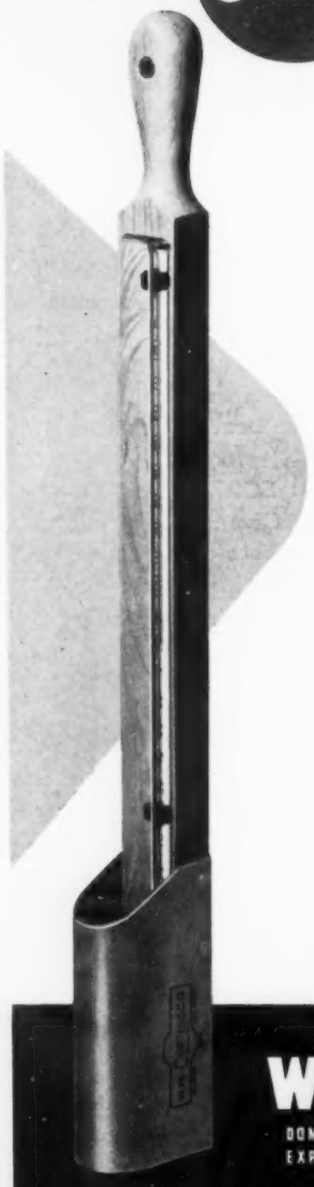
Gross joined the Empire companies in 1922 and remained with the Cities Service organization his entire business life. He had been a vice president and chief engineer for the Arkansas Natural Gas Corporation and in 1953 became vice president of Arkansas Fuel Oil Corporation.

John Blair Moffett, 73, Sun Oil Company counsel for 37 years, died March 10. A senior partner in the law firm of Moffett, Frye & Leopold, Moffett had been assistant secretary of Sun Pipe Line Company, director of SunGas Inc., and the Chilton Company.

CURTIN

A P I TANK THERMOMETERS

with "EVERLAST"
Fused-in Graduations



- **Permanent Graduations**—are etched in the glass, and filled with special pigment. Extra processing actually fuses the pigment into the glass so that it becomes a permanent part of the thermometer. Unaffected by oils or any other liquid not harmful to glass, "EVER-LAST" graduations can never fade, peel, or dissolve.
- **Guaranteed Accurate**—to within one scale division. Seasoned and annealed to assure permanent accuracy.
- **Easy to Read**—the mercury column appears red when viewed through the lens-type scale.
- **Finest Hardwood Case**—chosen from select hardwoods, cases are accurately made and finished smooth; resist warping and cracking. Friction clips hold tight, but permit easy exchange of tubes so that all ranges may be used. All metal parts are non-sparking.
- **Meets A P I and A S T M Specifications**—the provisions of A P I Standard 2500 and A S T M Specification E-1 are fully met by Curtin tank thermometers with "EVER-LAST" fused-in graduations.
- Available in ranges of —30 to +120° F., 0 to 180° F., 20 to 260° F. and 170 to 500° F.

For immediate shipment.

Write for free copy of 24-page Catalog G-56 Petroleum Gaging Equipment.

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DOMESTIC EXPORT • CURTIN PETROLEUM TESTING EQUIPMENT
HOUSTON - DALLAS - NEW ORLEANS - JACKSONVILLE
Established 1922 U.S.A.

WHO'S MEETING WHERE

April

Instrument Society of America, second national symposium on chemical and petroleum instrumentation, St. Louis, April 6-7.

Sixth Gas Compressor Institute, sponsored by University of Kansas and Southwest Kansas petroleum industry, Randall's Cafeteria, Liberal, Kansas, April 6-7.

AGA Operating Section Distribution conference, Netherland-Hilton Hotel, Cincinnati, April 6-9.

American Welding Society, 40th annual convention, Sherman Hotel, Chicago, April 6-10.

PIEA, PESA, joint meeting, Moody Center, Galveston, April 7-9.

ASME, hydraulics conference, University of Michigan, Ann Arbor, Mich., April 13-15.

Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla., April 14-16.

Conference on Industrial Instrumentation and Control, Illinois Institute of Technology, Chicago, April 14-15.

API, division of transportation, annual tanker conference, Jung Hotel, New Orleans, April 15-17.

ASME, oil and gas power conference, and exhibit, Shamrock-Hilton Hotel, Houston, April 19-23.

Natural Gasoline Association of America, 38th annual conference, Baker and Adolphus Hotels, Dallas, April 22-24.

Indiana Gas Association, French Lick-Sheraton Hotel, French Lick, Ind., April 22-24.

ASME, metals engineering conference, Sheraton-Ten Eyck Hotel, Albany, N. Y., April 29-May 3.

May

LPGA, 28th annual meeting, Conrad Hilton Hotel, Chicago, May 3-6.

API, safety and fire protection committees, 12th midyear meeting, Rice Hotel, Houston, May 4-8.

API Division of Transportation, annual pipe line conference, Penn-Sheraton Hotel, Pittsburgh, May 13-15.

International Petroleum Exposition, exhibit of oil industry equipment, Tulsa, May 14-23.

AGA, operating section transmission conference, Statler-Hilton Hotel, Dallas, May 18-19.

Pennsylvania Gas Association, Pocono Manor Inn, Pocono Manor, Penn., May 19-21.

ASME, design engineering conference, Convention Hall, Philadelphia, May 25-28.

14th Annual Short Course in Gas Technology, Texas College of Arts and Industries, Kingsville, Texas, May 27-29.

Fifth World Petroleum Conference, The Coliseum, New York City, May 31-June 6.

June

NACE, Teche Section, corrosion control short course, Southwestern Louisiana Institute, Lafayette, La., June 2-4.

NACE, Appalachian Underground corrosion short course, West Virginia University, Morgantown, W. Va., June 2-4.

ASME, semi-annual meeting, Chase-Park Plaza Hotel, St. Louis, June 14-18.

Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hotel, Atlantic City, June 14-19.

ASME, applied mechanics conference, Virginia Polytechnic Institute, Blacksburg, Va., June 18-20.

American Society for Testing Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, June 21-26.

Michigan Gas Association, meeting, Grand Hotel, Kackinac Island, June 22-23.

Canadian Gas Association, annual meeting, Empress Hotel, Victoria, B. C., June 22-24.

August

AIEE, annual petroleum industry conference, Wilton Hotel, Long Beach, Calif., August 23-26.

September

ASME, petroleum mechanical engineering conference, Rice Hotel, Houston, September 20-23.

NACE, western region conference, Bakersfield Inn, Bakersfield, Calif., Sept. 29-30.

October

NACE, southwest region, Jacksonville, Fla., Oct. 1-2.

NACE, northeast region, Lord Baltimore Hotel, Baltimore, Md., Oct. 5-7.

AGA, 41st annual convention, Conrad Hilton Hotel, Chicago, Oct. 5-7.

NACE, south central region, Cosmopolitan Hotel, Denver, Oct. 12-15.

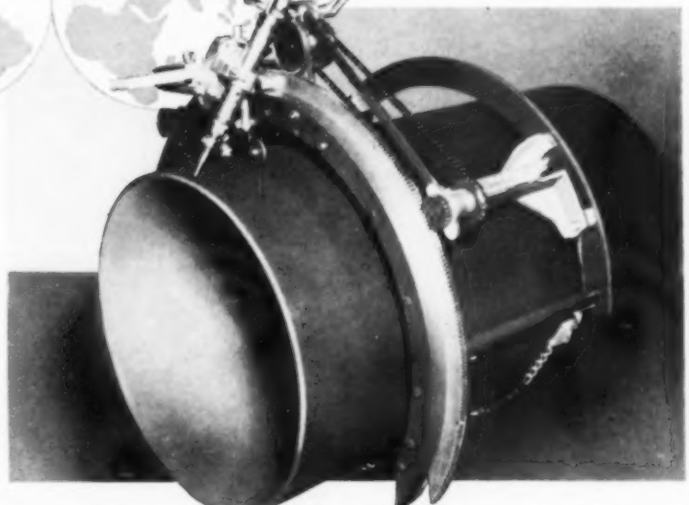
NACE, north central region, Cleveland, Oct. 20-22.

ASME, ASLE, lubrication conference, Hotel Sheraton-McAlpin, New York City, October 20-22.

November

Fifth International Automation Exposition, New York Trade Show Building, New York, November 16-20.

Wherever there are Pipelines . . .



You'll always find

MATHEY

PIPE CUTTING & BEVELING MACHINES

Sizes 1½" to 36" in Aluminum • 4" to 36" in Cast Iron

AUTOMATIC TONGS

For safer, faster and easier pipe handling. Releases pipe automatically. Does not require anyone near tong to release it.

SPECIAL PROCESS HARDENS ALUMINUM RING GEARS TO GIVE YOU DURABILITY YOU REQUIRE, YET MAINTAINS LIGHTNESS FOR FATIGUE-FREE WORK

Mathey Pipe Cutting and Beveling Machines are quick, easy, operating, assuring clean accurate cuts. It slips over pipe with no hinges or latches and a flexible shaft or motor unit attaches easily. Mathey machines are the result of over 25 years of engineering and field research. Complete stock of units and parts available at all times. Write for illustrated catalog.

- OUT-OF-ROUND ATTACHMENTS
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First & Oldest Manufacturers of Saddle-Type Pipe Cutting & Beveling Machines
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C. A. Mathey MACHINE WORKS, INC.

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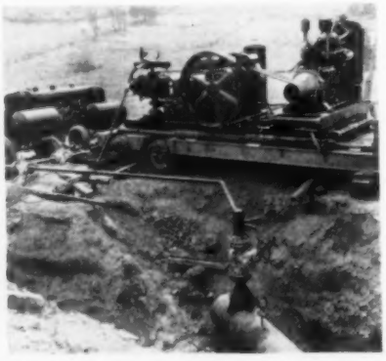
Testing site in Hickory, Pa. shows three compressors and three booster units in operating position. Set-up is capable of 1500 psi. Entire testing operation took but 84 hours.

COMPRESSED AIR AT 840 PSI GIVES PENNSYLVANIA CONTRACTOR:

New, economical way to test pipelines

Now, you can eliminate pipeline testing headaches, minimize costs and do the whole job faster with Schramm pipeline testing equipment. That's exactly what happened when Schramm tested a 5.6 mile section of 26" line to a pressure of 840 psi in just 84 hours for A. J. Curtis & Company on a gas pipeline for Manufacturer's Light and Heat Co., Pittsburgh, Pa. 109,000 cubic feet of pipe was tested in a minimum of time, with a minimum of operating expense and capital investment. Result: Schramm tested all remaining sections of the line.



Close-up view of boosters shows part of manifold and air line leading into the pipe being tested.

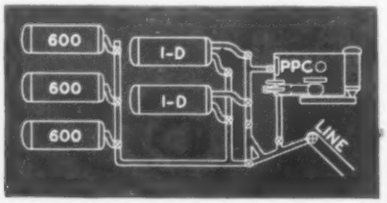


Diagram illustrates piping connections and positions of Compressors and Boosters.

Here's how it can work for you . . .

Complete package. All the equipment you need for any testing job—three Schramm 600 cfm Portable Compressors, two 1-D Booster Units and one PPC Booster Unit. Can be operated to 1500 psi.

Expertly trained operators. When you rent Schramm testing equipment, you also get the greatest amount of knowledge in the field from an operating team thoroughly experienced in pipe line testing.

Rent or Buy. Whatever your needs, occasional or constant, there's a Schramm package for you. Rent it—we'll bring it to your test site, or you can furnish your own transport. Buy it—keep your equipment right on the job for top convenience. You can use the compressors for any air requirements.

Outstanding Success. Schramm pipeline testing equipment is being used by contractors throughout the country with substantial success—in both testing results and product performance. Let us tell you more about it. Write today for your own estimating chart.

See the Yellow Pages for local Sales, Service and Rentals of Schramm Air Compressors.

Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

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ON THE LINE

AGA—Decade of Decisions

"Our decisions in the next 10 years will be the most important in our history," said Carl A. Cloud, president of the Southern Gas Association and MidSouth Gas Co., Little Rock, Ark. "They will determine our future as a major supplier of energy." The decade of decisions—the 1960s is the motif of the SGA's fifty-first annual convention in New Orleans, April 27-29.

At the distribution session Chester L. May, retired vice president of Lone Star Gas Company, will speak on "The Future of Gas Distribution." B. T. Mast, Trunkline Gas Company, and Dr. James M. Sharp, chairman of physics department at Southwest Research Institute, will report on the SGA study of non-destructive inspection of steel pipe. Speakers at the transmission section include H. N. Mallon, board chairman, Dresser Industries, who will explain "Engineering Developments as Applied to Gas Pipe Lines," and John H. Williams, president of Pipe Line Contractors Association and Williams Brothers Co., who will speak on "Our Common Objective—Build a Good Pipe Line."

President Cloud will deliver the traditional president's address and J. Theodore Wolfe, president of the American Gas Association and Baltimore Gas and Electric Company, will speak at the general session on "Teamwork for Progress."

Go-Devil Express to Titusville

In a special ceremony celebrating the 100th anniversary of the oil industry, greetings from governors of several western and midwestern states will be delivered to Titusville, Pa., via pipe line go-devils.

The Oil Industry Division, Oil Centennial, is staging "Celebration of the Century" at Titusville, August 27, where Drake's well came in 100 years ago. Among events scheduled is a second century oil conclave—a round table discussion at which nationally and internationally prominent scientists, statesmen and businessmen will usher in oil's second century; issuance

by Post Office Department of a special commemorative stamp; and unveiling of a monument at the site of the world's first oil pipe line.

Welders Graduated

A total of 12 students have completed the six-weeks Pipe Line Training School at Tulsa, which was sponsored by the Pipe Line Contractors Association. Six more students have started the course and several graduates at Kilgore, Texas, have taken one week refresher courses.

Information on welding school can be obtained from Richard Gump, executive secretary, Pipe Line Contractors Association, 2232 Republic Bank Building, Dallas 1, Texas.

1960 Contractors Meeting

The Ambassador Hotel, Los Angeles, has been confirmed as the site of the 12th annual convention of the Pipe Line Contractors Association, January 31-February 3, 1960.

New Corrosion Course

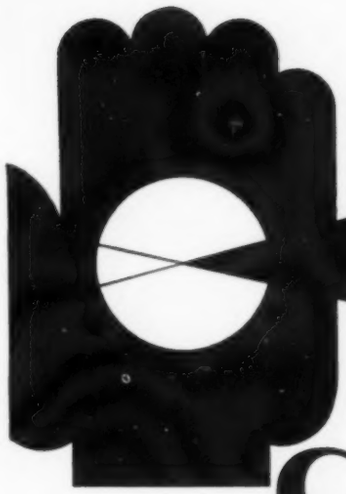
An intermediate level short course in fundamentals of corrosion reactions and corrosion control will be held at Massachusetts Institute of Technology June 22-26. The NACE will furnish services in conjunction with the short course.

This course is designed for those who have had previous corrosion instruction at short courses sponsored by the NACE or who have experience in the corrosion field and wish to broaden their understanding of fundamentals.

Additional information can be obtained by writing James M. Austin, Director of Summer Session, Massachusetts Institute of Technology, Cambridge 39, Mass.

Consulate of Venezuela

The Consulate of Venezuela has announced that its offices in Dallas have been established at 1309 Main St., Room 914-15. Office hours are from 10 a.m. to 3 p.m. weekdays.



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Cleans vapor, increases evaporating capacity; for high velocities at low pressure; broad flow range.

SCRUBBER

Guaranteed to remove 99.5% or more of ALL solid or liquid entrainment—dust, fumes, sulfides, fly ash—in gas, air, steam or vapor.

LINE-TYPE SEPARATOR

Removes water from steam; increases heat transfer; removes water, sand, brine at well head; protects turbines, compressors; keeps compressed air lines free of oil and water. For any pipe size, horizontal or downflow use, any pressure, temperatures to metal tolerance.

1. **Increase Your Profits**—Get MORE production from your present equipment PLUS valuable by-products that help pay for this improvement.
2. **Removes 99.5%** or more of ALL solid or liquid entrainment—HIGHEST of all!—in any gas, air, steam or vapor regardless of density, chemical characteristics or size.
3. **Protects valuable capital equipment** from costly shutdowns and major overhaul.
4. **LOW first cost**—smaller size saves space; installs easily, quickly—saves time, labor, money. Needs no costly, cumbersome supporting structure!
5. **Cuts maintenance expense** — no expensive filters to replace or clean, no moving parts, non-clogging, self-cleaning. Only Centrifix has the patented helicoid tuyere!
6. **Improves product quality**—takes out the smallest, toughest "hidden" entrained particles, makes final product MORE valuable, turns WASTE into PROFIT!
7. **MINIMUM pressure drop** regardless of flow rate, temperature or pressure due to Centrifix's patented helicoid tuyere!
8. **Purifies** with NO heat loss, uses no wetting agent!
9. **Complete Engineering Service** to survey and solve your particular entrainment problem.
10. **Custom-Engineered** to the exact requirements of pressure, flow rate, temperature and characteristics of the flowing medium and entrainment.

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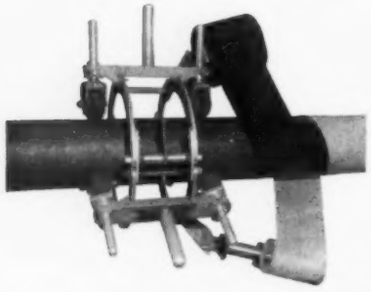
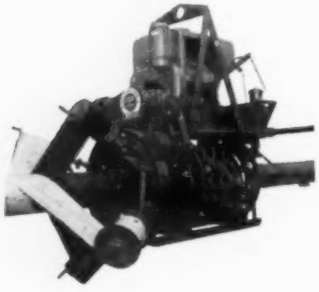
HERE ARE MACHINES THAT BRING ADDED EFFICIENCY TO YOUR TAPING AND CLEANING AND TAPING.



The MYOCO Tapemaster can use four arms to give any combination of tape and kraft or felt. Six various size machines available for ½" through 36" pipe; small machines use tape from ½" width through 9", large machines use 9" through 18" tape.



MYOCO Model OW Power Driven Cleaning and Taping machine combines two operations for increased speed of operations with less equipment. Line travel machines are available to handle pipe sizes 3" to 6", 6" to 12", and 14" to 20". A Wisconsin Model Vg4D V-type 4-cylinder heavy-duty air cooled engine, combined with the design and engineering features of this machine, guarantees uninterrupted service.

When you use MYOCO pipeline equipment, you quickly find that servicemen are experienced and available twenty-four hours a day, with fast transportation available to serve you in any way; efficient equipment operation is assured by periodical checks; and if possible, parts and supplies are shipped the same day ordered.

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

What's Happening among SERVICE and SUPPLY MEN

K. W. McDowell

Carl J. Seefeld

Coast Paint and Lacquer Names New President and Board Chairman

K. W. McDowell has been promoted from president to chairman of the board and Carl J. Seefeld has been elected president of Coast Paint and Lacquer Company.

Other new appointments include R. M. Johnson as assistant to the president in charge of sales, and H. C. Owens, assistant to the president in charge of product research and development.

McDowell, one of the founders of the company, became president in 1951. Seefeld joined the firm in 1949 and was named executive vice president and general manager in 1955. Johnson, who joined the company in 1951, formerly was vice president and technical director. Owens, who had been vice president in charge of research and production, has been with the company since 1949.

Allis-Chalmers Appoints New Director and Vice President

Allis-Chalmers Manufacturing Company has elected a new director and vice president. Joel Hunter, president of Crucible Steel Company of America, has been named an additional member of the board. Beauchamp E. Smith, general manager of the hydraulic division, was elected a vice president.

An attorney and certified public accountant, Hunter has been president of Crucible since 1954. Smith previously was president of the S. Morgan Smith Co. which recently became the York Works of Allis-Chalmers.

La Barbera Named Vice President, Manufacturing by J. B. Beaird Co.

Joseph La Barbera has been promoted from manager of production to vice president of manufacturing of the J. B. Beaird Company, Inc. La Barbera joined Beaird as assistant plant superintendent in 1955 and was promoted to manager of production in 1957. He will be responsible for all manufacturing operations of the company's plants.

La Barbera was formerly general superintendent of Vicksburg Tank Company and served a number of years with Carbide and Carbon Chemical Company.

Atlas Powder Company Names O'Driscoll Safety Engineer

Jeremiah J. O'Driscoll, Jr. has been named safety engineer for Atlas Powder Company's explosives division. O'Driscoll came to Atlas from Catalyst Research Corp. where he was safety supervisor and industrial security officer. Previously he had been explosives safety engineer at U.S. Naval Ordnance Laboratory.

Purcelli Named General Manager Of Rockwell's Porterville Plant

Ralph A. Purcelli has been named general manager of Rockwell Manufacturing Company's Porterville plant. Purcelli had been executive assistant to the general manager of the company's Barberton plant.

R. A. Purcelli

Previously he had been general manager of the Statesboro plant. He joined Rockwell in 1936, was named general foreman of the Nordstrom valve department in 1943, general foreman of meter and regulator assembly in 1950, general superintendent of the Barberton valve plant in 1951 and assistant general manager of the Norwalk plant from 1954 to 1956.

United States Steel Plans New Building, Offices in Texas

United States Steel Supply Division plans construction of a new warehouse and office at Arlington, Texas. Construction will begin soon on a one story structure covering approximately 39,000 square feet. The new steel service center will replace a smaller office in Dallas.

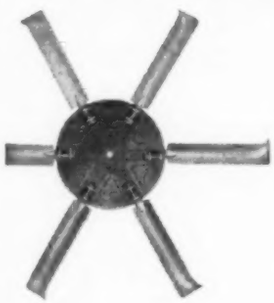
The plant will serve Northern and Central Texas industrial customers with complete stocks of all general line steels.

Youngstown Sheet and Tube Co. Announces Two Promotions in Sales

Youngstown Sheet and Tube Company announces two promotions in the sales department. Clarence E. Short, assistant district sales manager Minneapolis, becomes Minneapolis district manager succeeding Charles S. Hogan. Albert S. Harris, oil country tubular sales staff, becomes assistant manager of the oil country tubular sales.

"HIGH and mighty"

move mountains - of AIR!
in towers and exchangers



- Sizes 14′ to 18′
- 4 or 6 blades

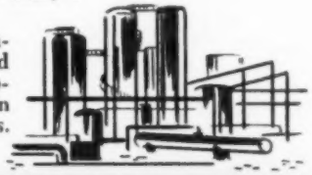
Developed originally for the petroleum industry, Aerovent Large-Diameter "Al-metal" Propellers, constructed of tough, durable aluminum alloy, move great quantities of air at high velocities, in heat exchangers and cooling towers. Pictured above are two 4-blade, 16-ft. propellers in a cooling tower installation. These mighty propellers, with adjustable-pitch "Macheta" Airfoil blades, are job-engineered to individual specifications.

Write for free Bulletin 510

DESIGNED FOR DEPENDABLE OPERATION!

Endurance tests, conducted at *3 times* normal loading prove the ability of these new large-diameter propellers to withstand severe punishment. Heavy-duty cast steel hubs offer maximum resistance to stresses. Angle settings for each operating requirement, and appropriate alternate settings, assure accurate pitch for any predetermined performance which may be required. 54″ to 144″ now available in revolutionary new "T-Alloy".

REFINERIES, pumping stations, industrial plants and commercial buildings use Aerovent "Al-metal" Propellers in major air-moving applications.



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● No matter how specialized the liquid level control application, adapting Magnetrol to meet it presents no problem. Whether it's for high pressures, high temperatures, corrosive liquids or any other condition, a few "standard" modifications and the job is done! Operation is so simple no changes in basic design are needed. That's why Magnetrol "fits" practically any application — why "specials" are so often standard with us.

Because of the utter simplicity and dependability of its magnetic principle, Magnetrol has *infinite operating life.* There are no wearing parts to get out of order.

Magnetrols are available for controlling level changes from .0025-in. to 150-ft., with single or multi-stage switching. Our experienced engineering staff is at your service.

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WHY NOT MAIL THE COUPON — NOW

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Please send me catalog data and full information on Magnetrol Liquid Level Controls.
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Company_____
Address_____
City_____ Zone____ State____

Short has been with the company since 1937 and Harris has been with Youngstown since 1934.

Peter C. Jurs Elected Executive Vice President

Peter C. Jurs has been named an executive vice president of the Shand and Jurs Company. He will be responsible for all the production operations of the company.

He has been with Shand and Jurs for 22 years and has been a vice president since 1954 in charge of mechanical products division. George Fournier has been named manager of the New York office, succeeding R. F. Ley. Fournier has been with the firm since 1949, serving in a sales capacity.

Clarence H. Reinecke Becomes Milwaukee District Office Manager

Clarence H. Reinecke has been named manager of the Milwaukee district office of the National Cylinder Gas Division of Chemetron Corporation.

He replaces A. L. Breyvogel, who retired after 18 years of service. Reinecke became assistant manager of the Milwaukee district in 1954. He was employed in sales and service work in the division's St. Paul office since joining the company in 1949.

Portable Bridge and Equipment Names Massey Sales Engineer

J. E. Massey has been appointed sales engineer of Portable Bridge and Equipment Co., a C. N. Housh interest. Formerly chief engineer with a Baton Rouge, La., metal fabricator, Massey is a member of the American Welding Society and Houston Engineers Club.

L. E. Muzzy

R. R. McKiel

N. G. Esbrook

A. W. Meyer

International Harvester Names Four Sales Representatives

International Harvester announces four appointment in Engine Sales department. R. R. McKiel, supervisor on manufacturer sales, has been named assistant manager of Engine Sales department.

A. W. Meyer, who has been with the company 18 years, becomes supervisor of manufacturer sales. N. G. Esbrook is the new supervisor of sales promotion and L. E. Muzzy has been appointed supervisor of distributor sales.

McKiel has been with International Harvester since 1934 working with engines and power units since 1947. Esbrook joined the firm in 1951 and has been in engine service and engineering work. Muzzy joined the construction equipment division in 1956 as head of the replacement engine section.

A. O. Smith Corp. Opens Southeast Branch Building

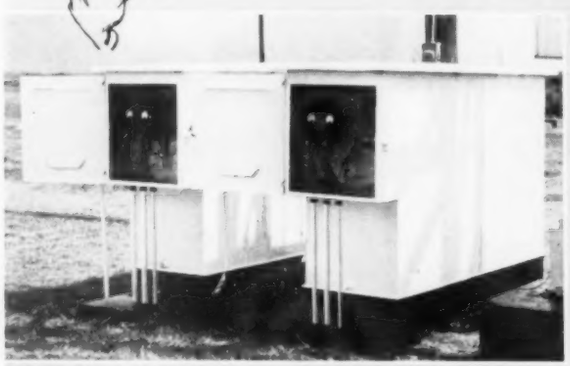
A. O. Smith Corporation announces the opening of its southeast branch product service building in Atlanta. The new facilities have 12,000 square feet of floor space. The building will handle product service for Georgia, Mississippi, Tennessee, North and South Carolina, Alabama and Florida.

J. A. Snyder is manager of the product service branch. The new office will also serve as the district sales office for the company's Permaglas division, with F. K. Toney as sales manager.

Atlas Valve Names Petervary New Jersey Sales Representative

Victor J. Petervary has been appointed sales representative for the northern New Jersey territory for Atlas Valve Company. Petervary comes to Atlas from Swepco Tube Corporation. Previously he had been associated with Cooper Alloy Corporation.

STOP CORROSION WITH B-K CATHODIC PROTECTION EQUIPMENT



CHECK THESE B-K RECTIFIER ADVANTAGES:

- Selenium stacks or Silicon Diodes derated for climatic conditions
- Heavy duty transformer
- All-welded, heavy-gauge steel case—double hot dipped galvanized
- Weston Type 506 D. C. Voltmeters & Ammeters, or equivalent

B-K Recifiers are Custom Engineered

COMPLETE CATHODIC PROTECTION EQUIPMENT — BK

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Brance-Krachy Co. INC.

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BEAUMONT, 1050 RAILROAD, PH. TE 3-2679—TULSA, P. O. BOX 4593, PH. RI 3-2490

SIE Names Rex B. Grey Manager of Control Division

Southwestern Industrial Electronics Co. announces the appointment of Rex B. Grey as manager, control division. Grey joins SIE after being associated with the Texas Apparatus Company, which he founded in 1954. Previously he had 10 years in various phases of management in the General Electric Co. Grey will be responsible for the sales, service and market areas of the control division, and will select and administer production of new systems and instruments.

Rex B. Grey

W. J. Chisholm

J. R. Windle

Jones & Laughlin Announces Changes in Canadian Sales

Jones & Laughlin Supply Division announces the appointments of two salesmen in Canadian field sales organization. J. R. Windle, salesman at Edmonton, Alta., has been transferred to Calgary, Alta., and W. J. Chisholm, store manager at Drayton Valley, Alta., has been appointed salesman at Edmonton.

Windle has been with the company since 1951. Chisholm joined Jones & Laughlin as a store manager in Stettler, Alta., in 1953. He was named salesman at Stettler in 1955 and became store manager in 1957.

Carson R. Schall Transferred By Reynolds Metal Company

Carson R. Schall, chemical and petroleum market representative in Reynolds Metal Company's Dallas office, has been transferred to Maracaibo, Venezuela, as foreign sales representative.

Schall joined Reynolds in 1953 as regional sales engineer. He became industrial salesman for the St. Louis, Mo., area in 1954 and in 1956 moved to Dallas.

Youngstown Sheet and Tube Plan Expansion for 1960

Youngstown Sheet and Tube Company will expand its tinplate facilities next year to include a second new continuous annealing line for its No. 2 tin mill, Indiana Harbor Works, East Chicago.

Construction is expected to start early next year with completion scheduled for sometime in 1960. Preliminary engineering work is presently underway.

Smithco Engineering, Inc. Selects Darling Vice President

R. A. Darling has been named a vice president by Smithco Engineering, Inc. He will serve as manager and coordinator for all sales activities for the corporation.

R. A. Darling

Darling was associated with Cooper-Bessemer for 10 years and in 1954 formed the Darling Company. He served as manufacturer's representative for a line of products including air cooled heat exchangers, pumps, cooling towers, speciality valves, pulsations dampening and silencing equipment and engine maintenance equipment.

A. O. Smith Corp. Purchases Erie Meter Systems, Inc.

A. O. Smith Corporation has purchased the Erie Meter Systems, Inc. Erie manufactures equipment for the dispensing of petroleum products at service stations, airports, industrial plants and farms.

H. G. Smith, manager of A. O. Smith's Meter, Service Station Pump divisions will serve as president of Erie. W. B. Johnson, sales vice president of Erie, will serve as staff assistant to Smith. H. D. Leisenring of A. O. Smith, will become general sales manager of the new organization. John Thompson, Erie, will be assistant sales manager.

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Wipe out Weeds and Brush

for as long as ***8*** *to* ***18*** *months*

with one application of UROX®

Now you can wipe out troublesome weeds and brush faster, easier, at lower cost and for a longer time with just one application of Allied Chemical's UROX Weed Killer.

This powerful herbicide effectively handles weed killing jobs on tank farms, around refineries and pumping stations, and along pipelines. It destroys weeds and brush in non-crop areas wherever they form a fire hazard, an eyesore or a maintenance problem.

Longer lasting! Saves time and money! UROX tends to build up increasing soil sterility. Its herbicidal action can thus be extended from one year to the next with light booster doses. As smaller and smaller amounts are used over a period of time, you realize substantial savings.

Get the whole story! Send today for our new full-color UROX folder, "Candidly Speaking." You'll see unretouched candid camera evidence of UROX's effectiveness in many widely-separated geographical areas, many different climatic conditions. These actual photos from the field tell the UROX story with greater accuracy than words can convey.

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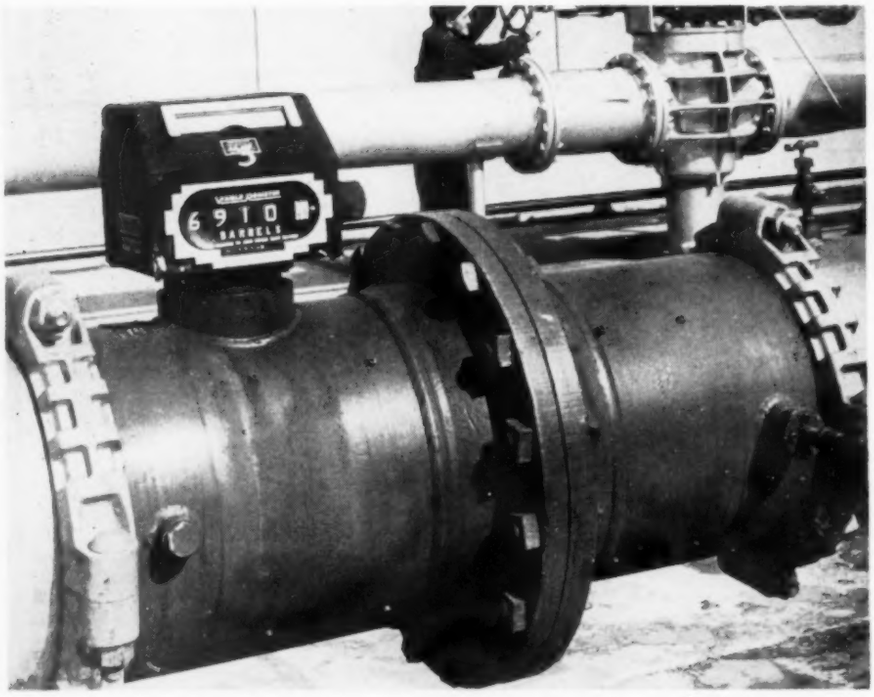
For more data on advertised products, use Readers' Service Cards, last page.

What's New in EQUIPMENT



Rockwell Introduces Turbine Type Meter

Rockwell Manufacturing Company has developed a 16-inch, 15,000 barrels per hour positive "screw displacement" turbine-type meter. With a completely new design in meters, the turbo-meter has shown these characteristics in tests: Capacity of 15,000 bph with liquids up to 500 SSU viscosity, accuracy of better than fifteen parts in ten thousand, repeatability of better than one part in five thousand, and range from crudes to products with the same unit without need for adjustments.

Unusual design features of the meter include a rotor metering element weighing only 4 pounds; a viscosity compensator and a magnetic coupling completely sealed from the line product. The meter is based on the principle that there is a direct relationship between the rate of liquid flow through the meter and the speed at which a rotor element is rotated by force of the flowing fluid.

The metering element is the 4-pound, ball bearing suspended turbo-rotor. Rotor blades are low drag, air foil sections upon which the liquid flow impinges. Located on the upstream end of the rotor shaft, the viscosity compensator provides a viscous brake type effect to mechanically impose a drag on the turbo-rotor which is directly proportional to the viscosity of the liquid measured. This controls the turbo-rotor slippage and maintains a constant relationship between flow velocity and rotor speed.

A two-pronged, fork-shaped magnetic driver on the downstream end of the turbo-rotor shaft can be used to magnetically transmit power to either a mechanically actuated conventional register or to an electrically actuated register system. Regardless of type of register used with the meter, the magnetic coupling transmission is a sealed unit not exposed to the line product.

The fluid flow is guided into and away from the rotor by diffuser sections. The upstream diffuser section houses the viscosity compensator and the downstream section houses the magnetic coupling. The downstream diffuser acts as a recovery chamber to keep head-loss at a minimum.

The turbo-meter in operation is in-line, relatively light (approximately 1,000 pounds) and small (42 inches long and 20 inches high from center of pipe) which makes installation relatively easy. The unit has a long life and holds its accuracy and calibration.

To be shown at the International Petroleum Exposition, Tulsa, May 14-23, 1959.

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Detachable Trencher

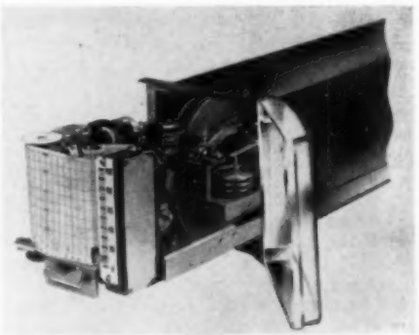
Deltec, Inc., has developed a detachable trencher which does not tie-up a tractor for a single function.

The "Laster" trencher can be detached to free tractor for power tilling, grading, plowing or any other job usually accomplished with a tractor.

Any wheel type tractor with a live power take-off, ASAE Standard 3-point hitch, can be equipped to operate the laster trencher. An "incher" device moves the tractor forward at the correct rate of speed to allow the adjustable high carbon abrasion resistant steel cutters to dig from 6-inch to 14-inch wide trenches.

Moving at a rate of 500 feet per hour, the machine digs a trench to a maximum of 4 feet in depth with standard equipment. Boom extension is available for deeper trenching.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.



Pneumatic Meters

The Bristol Company announces that dynamaster instruments are available in pneumatic transmitting models. Potentiometers, pyrometers, ac and dc bridges and differential transformer receivers with pneumatic output transmit a 3-15 psi signal. The pneumatic transmitting models are especially suitable for use with Bristol's metagraphic pneumatic instruments. The 663 series occupy the same panel space as the metagraphic instruments and dials and charts are consistent with the metagraphic series.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

ANNOUNCING:

. . . the appointment of new CATERPILLAR Dealers in EASTERN OKLAHOMA . . . for a territory formerly served by McCORMICK MACHINERY COMPANY . . . for the nationally-known

CATERPILLAR

EARTHMOVING EQUIPMENT-TRACTORS-ENGINES
MOTOR GRADERS-PARTS AND SERVICE

The plans, policies and pleasant service of the McCormick Machinery Co. will be continued by Dick Albert and Jack Harlow, new Caterpillar dealers, both of whom have had years of sales experience in oil and construction work. Personnel will remain the same: the main change is the name. They are ready to offer you the finest in Caterpillar parts, service and used equipment. Stop by and get acquainted . . . now!

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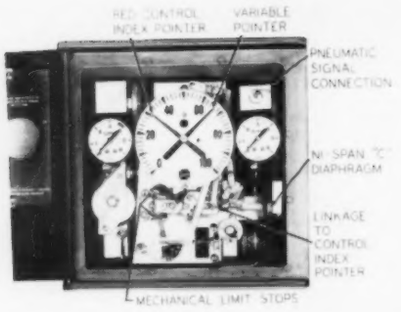
CATERPILLAR AND CAT ARE REGISTERED TRADE MARKS OF CATERPILLAR TRACTOR CO.



Indicating Controller

A pneumatic set point adjustment has been added to the line U.S. Gauge Division indicating controllers. It is available with measuring elements for temperature, pressure, liquid level, or flow with various types of pneumatic control action, as required. The indicating controller can be mounted directly on the diaphragm motor valve that it operates.

The new feature is of value for application where controller is remotely located and operator wants to adjust set point at a centralized control panel with a pneumatic loading station; or where an accurate program control is required.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

Plug Valve

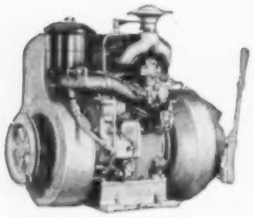
Hamer Valves, Inc. has developed a new plug valve for high pressure service which can be used in lubricated or non-lubricated service. The valve has a straight cylindrical seat, with a segmented design. The plug's corrosion resistant hard seating surface fits into a set of four metal segments serving as replaceable seats in the valve body. The seats are locked together and float slightly due to their synthetic elastomer backing. Under pressure, the seal segments rest metal-to-metal against the body.

No plug adjusting nut is needed; there are no adjustments to make. The new D series valves are designed to function between —40° and 250° F and are manufactured in 1-inch and 2-inch sizes. In addition to the 15,000 psi valve, Hamer is producing models for 10,000 and 5,000 psi and is developing a 3,000 psi model.

(This item supplements Hamer Valves, Inc. data on pages 225-228 of the Pipe Line Catalog, Second Revision.)

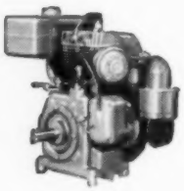
For more data, circle **No. E5** on Readers' Service Card, last page this issue.

WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES



Model THPD Oil Well Pumping Engine with heavy-duty clutch and extra flywheel for developing follow-through High Momentum Factor.

have the **GUTS** for rugged Oil Field Service



Models ACN-BKN single cylinder 3 to 7-hp. (smallest engines in the Wisconsin line).

ROUGH-AND-READY oil field service calls for everything you can put into an engine — for on-the-job endurance, long life, self-sustaining dependability, low-cost operation and maintenance. You get it all in *all* Wisconsin Engines, regardless of type or hp. rating.

Even the smallest Wisconsin single-cylinder models have basic features such as: tapered roller main bearings . . . at *both* ends of the drop-forged, counterbalanced, heat-treated crankshaft; 4 piston rings for a tight power seal and protection against excessive cylinder wear; an outside-mounted, weather-tight high-tension rotary-type magneto, equipped with Impulse Coupling for fast starts in any weather; positive pump-circulated lubrication . . . and many other "plus value" features.

A complete power range from 3 to 56 hp. offers selectivity to fit the job and the machine. All models are designed for efficient operation at all temperatures from low sub-zero to 140° F., and can be supplied with Electric Starting, Automatic High Temp. Safety Switch. Buyer's choice of fuel systems: gasoline, natural gas, LPG or combination gas and gasoline.

Tapered roller main bearings take up radial loads and end thrust . . . protect against bearing failure.

Positive lubrication . . . forged connecting rods with heavy-duty bearings

Heavy-duty, weather-sealed outside magneto with Impulse Coupling.

These are some of the reasons why you can't do better than to specify "WISCONSIN" for your oil field utility units.

WISCONSIN MOTOR CORPORATION
Milwaukee 46, Wisconsin

WRITE TO HARLEY SALES CO.
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505 SOUTH MAIN STREET • WICHITA, KANSAS

Oil Field Distributors for Wisconsin Engines and all types of Utility Engines

World's Largest Builders of Heavy-Duty Air-Cooled Engines

A9-6279

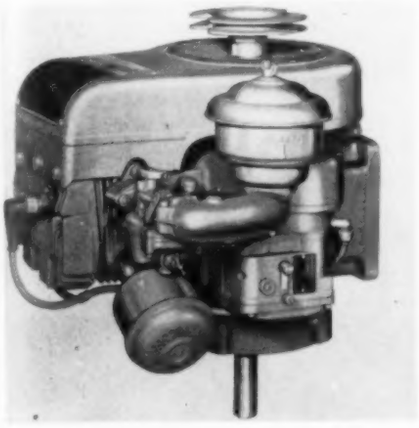
Holiday-Detector

Pipetron Company announces a holiday detector used to inspect pipe lines after they have been laid underground. The instrument reveals damage to coating caused by backfill and other defective spots. It is also used for regular maintenance inspections.

The transistorized transmitter permits

inspection of several miles of pipe daily. An output meter in the transmitter assures optimum matching to the pipe line for maximum signal strength. It is equipped with a visual indicator in the receiver in addition to earphones. The search coil doubles the receiver as a sensitive pipe locator for locating pipe and for locating shorts between pipe lines.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

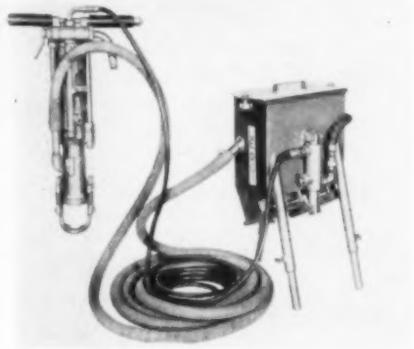


Vertical Shaft Engine

Wisconsin Motor Corporation announces development of a vertical shaft engine to provide heavy-duty power units of higher horsepower.

Two models—HACN with a power range of 2.5 hp to 6 hp, at 1,600 to 3,600 rpm, and the HBKN with a range from 3.5 hp to 7 hp at 1,600 to 3,600 rpm.—are in production. These engines are designed and engineered for compact, low silhouette applications. Positive lubrication is supplied by a vane-type oil pump which furnishes spray in crankcase to lubricate all internal engine parts. The oil pump is driven off the crankshaft and located in the engine base.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.



Dustless Drill

Le Roi Division, Westinghouse Air Brake Co., has introduced a new dry, dustless drill which eliminates dusty drilling conditions.

Cuttings are drawn into a 5-hole CRD or Vac-Nu-Matic bits, through hollow drill steel, into the drill chuck, and immediately out the side of the chuck housing. Cuttings do not travel through the drill, nor do they come into contact with working parts of the drill. Modified versions of the dustless drill are available with drilling attachments offered for use with the Le Roi 125 Tractair, such as the Mobildrill or Trac-Jac.

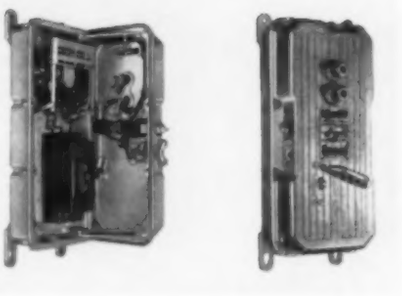
For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Shut-Off Valve

A manual shut-off, Valve Model 949T, for high pressure gas systems, has been announced by Circle Seal Products Company. New features of the valve include easier operation with threads above seal out of fluid stream, reduced operating torque and increased depth of finger detents in handle. A resilient O-ring, which is withdrawn completely and automatically from fluid stream as valve begins to open, provides leak-proof shut-off.

The valve consists of a shut-off section and a throttling section, both accomplished in a single motion.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.



Combination Line Starters

Crouse-Hinds Company announces two new combination line starters and a model change in the EPC explosion-proof and dust-ignition-proof starters and combinations in 7-inch and 9-inch sizes.

the

SPREAD

is the thing . . .

. . . that makes the difference. The **spread** between a first class job and a mediocre one is simply this . . . the **spread** between close attention to details and a slip-shod operation.

Sheehan Spreads are famous for their close attention to details as well as friendly relations with property owners. From the first estimate to final clean-up, Sheehan's careful planning and efficient operation is aimed at making sure your job is a job well done.

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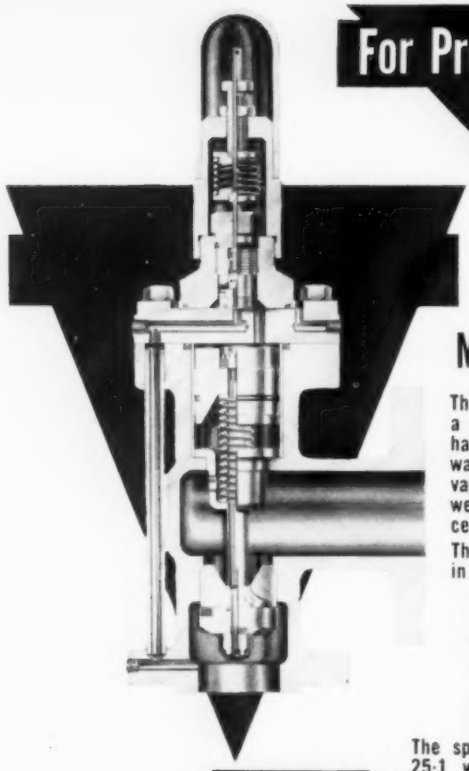
NATIONAL BANK OF TULSA BUILDING

TULSA, OKLAHOMA



For Pressure Relief of LPG, Gases or Vapors

Specify Kinzbach Model 414 Relief Valve

The new Kinzbach Model 414 relief valve with a flat seated pilot valve is designed to best handle fluids having a viscosity lower than water, such as light products, LPG, gases and vapors. The pilot valve can be either spring or weight loaded. Pressure blow-down of ten per cent permits pilot to reset for valve closure.

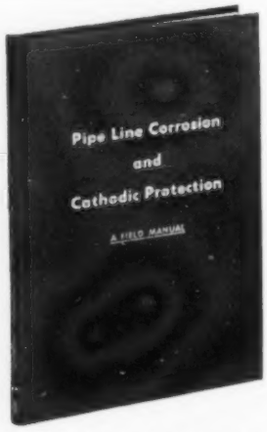
This relief valve incorporates advantages found in other Kinzbach relief valves of:

Positive action • dependability • instantaneous opening • automatic reseating • no chatter or wire drawing at seat • functional testing • simplicity and ruggedness • high capacity • positive seating • corrosion resistance • no pressure accumulation needed.

The spring loaded pilot ratio of the model 414 is 25:1 with working pressure ranges from 100 psi thru 1600 psi. For complete details on this and other Kinzbach pressure relief valves, write for catalog.

KINZBACH TOOL CO INC

KINZBACH TOOL CO., INC.
P. O. Box 277, Houston, Texas
Export Office: 74 Trinity Place, New York, N. Y.



The most practical on-the-job manual for men concerned with pipe line corrosion.

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This book is designed as a practical field manual. It provides workable methods that can save you valuable time and effort in obtaining interpretive field data.

Contents (Condensed). Soil Resistivity Surveys, Pipe-to-Soil Potentials, Line Currents, Current Requirement Surveys, Rectifier System for Coated Lines, Ground Bed Design and Installation, Magnesium Anodes on Coated Lines, Hot Spot Detection, Stray Current Electrolysis, Interference in Cathodic Protection, Operation and Maintenance, Coating Inspection and Testing.

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The dust-ignition-proof DMC and watertight WMC line starter condulet enclosures are the same design except for body and cover mating surfaces. The DMC and WMC are designed to accept and operate any of the various makes of motor starters and circuit breakers. Single speed non-reversing combinations are equipped with a universal mounting plate, motor starter reset assembly and circuit breaker operating assembly.

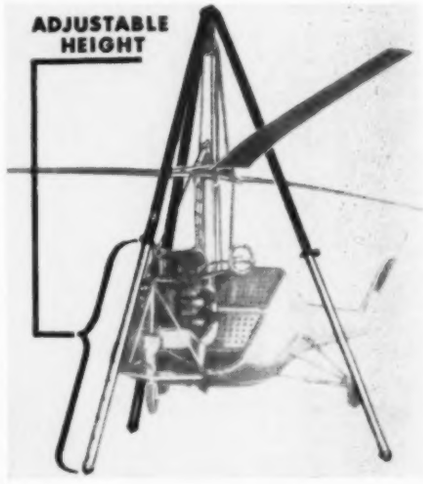
Mounted on a separate, replaceable frame that provides 3-point suspension, the EPC Model M59 assures effective water shedding for the entire body with male threads at the top, female threads at the bottom, and a skirted upper cover.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.

Liquid Level Control

A new model KT-Tandem Control has been added to Jo-Bell Products, Inc.'s extensive line of liqud level controls. This control is designed with two electrical signals, high and low level, in one explosion-proof housing. The Tandem Control is available for internal and external installation.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.



Heavy-Duty Tripod

B. E. Wallace Products Co. has made available a redesigned heavy-duty tripod for assisting in installation and maintenance work including locations nearly inaccessible to most lifting equipment. The telescoping legs permit one man to place the tripod in tight locations. The tripod is available in six models; pads which prevent legs from sinking into soft ground and slipping on smooth surfaces are available.

For more data, circle **No. E12** on Readers' Service Card, last page this issue.

SALES ENGINEER WANTED

Well-established successful firm has opening in an expanding sales department for young man looking for an opportunity in sales work. Must be college graduate, not over 33, in good health and not afraid of work. Oil industry experience desirable. Applicant will be trained at home office before moving into sales work on basis of salary plus commission incentive and traveling expenses. Our own sales personnel know of this advertisement. Your reply will be confidential and should be sufficiently complete to merit contacting you for an interview. Address Box 53-P, PIPE LINE INDUSTRY, Houston, Texas.

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Expansion Joints

Garlock Packing Company has published a bulletin on the construction, sizes and uses of rubber, neoprene and Teflon-lined expansion joints.

Characteristics and limitations of several expansion joints are described including the spool-type, regular type, U-type, all Teflon, full face Teflon lined rubber expansion joints and the Teflon flexible couplings.

To get a copy, circle **No. E13** on Readers' Service Card, last page this issue.

Blasting Cost Chart

The hip pocket blasting cost chart recently released by Atlas Powder Company supplements the file-size chart. The small chart provides a way to make quick orderly cost records while drilling, loading, and shooting a blast.

On one postcard size chart there is space for all data of burden, spacing, powder, stemming, and detonators for a blast of up to 20 drill holes. The charts are printed on heavy stock to stand up in the hand outdoors without need of backing.

To get a copy, circle **No. E14** on Readers' Service Card, last page this issue.

Control Switches

Allis-Chalmers announces a bulletin describing features of its Type 210 instrument and control switches. The switches are used in conjunction with circuit breakers, transformer tap changers, motor-operated rheostats, instruments and other electrically controlled apparatus.

Among important features of the switches pointed out in the bulletin are flexibility, accessibility and dependability.

To get a copy, circle **No. E15** on Readers' Service Card, last page this issue.

Six KMC Microwave

General Electric Communications Products Department has issued a bulletin describing the new 6 KMC line of microwave. The new equipment features capacity up to 120 channels, time or frequency division multiplexing, passive bridging, plug-in units, and highly reliable Klystron tubes.

The bulletin explains the frequency bands in which the apparatus can be used, dimensions of basic terminals, power consumption and other nominal specifications.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Preventive Maintenance

The Xzit Chemical Company has released a proposal covering preventive maintenance products and services which cover coatings for corrosion prevention ranging from sub-zero to highly elevated temperatures in the 2000° F plus zones. The highly illustrated broshure includes sections of technical bulletins, general product literature and product and price bulletins.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Thermometers

Rochester Manufacturing Company has available a complete catalog describing its line of industrial thermometers.

The 12-page, two-color booklet includes testing facts and detailed thermometer descriptions and specifications. Explained are Rochester's reasons for hermit sealing, external recalibration and double dampening.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Recorder

Houston Instrument Corporation has issued a four-page bulletin on its RH-92 X-Y recorder which can be used for computer readout, hysteresis curves, semiconductor and tube characteristics, stress/strain, temperature/pressure, etc.

The illustrated folder describes the internal mechanism of the unit, explaining its features in detail.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

Cast Steel Valves

Kerotest Manufacturing Company has issued a bulletin covering the company's complete line of series valves.

The booklet contains data on the cast steel gate, globe, angle, and swing check valves. The two-color, 20-page catalog contains illustrations and charts on the various kinds of valves.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.

Sprockets and Idlers

Caterpillar Tractor Co. has published an eight-page, three-color booklet on sprockets and idlers. "Power and Guidance" is complete with illustrations of various design characteristics and manufacturing processes of these units.

To get a copy, circle **No. E21** on Readers' Service Card, last page this issue.

Polyethylene Pipe

Hercules Powder Company has published data sheets on its polyethylene resin for pipe named Hi-fax 1700E Pipe Black.

Twelve data sheets with graphs discuss factors affecting long-term performance of polyethylene pipe.

To get a copy, circle **No. E22** on Readers' Service Card, last page this issue.

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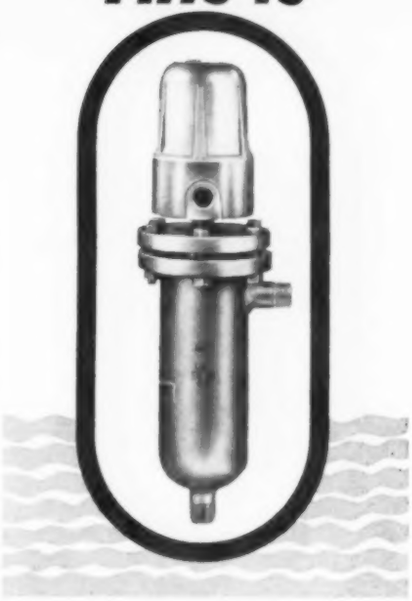

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- Finds leaks faster, more accurately
- Weighs 80% LESS than ordinary equipment

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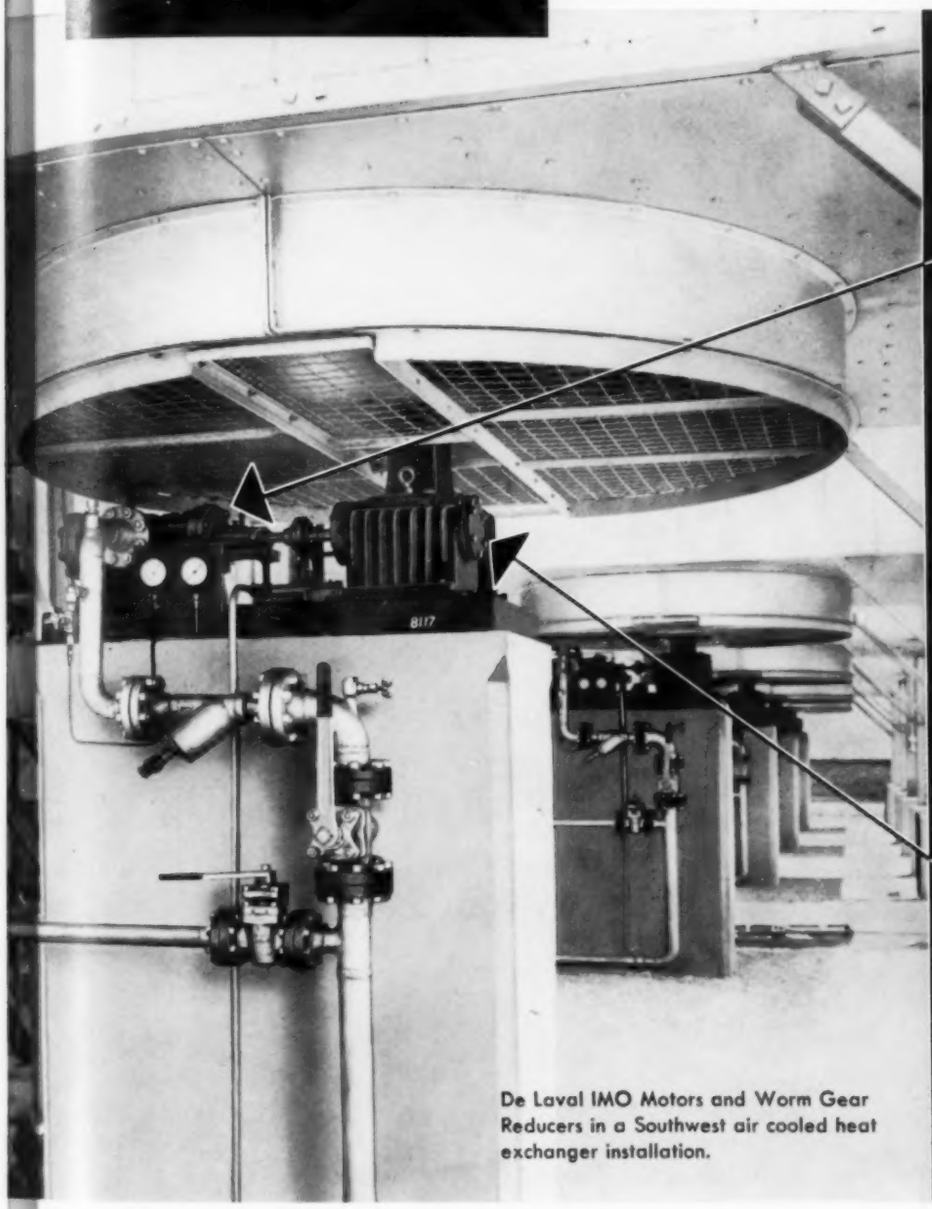
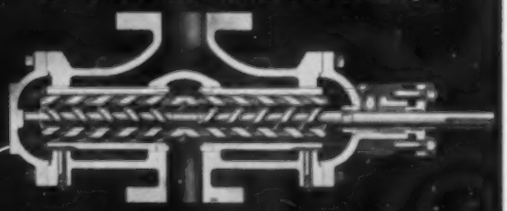
HYDRAULIC FAN DRIVES

do dependable, power-saving job in air-cooled cooling towers



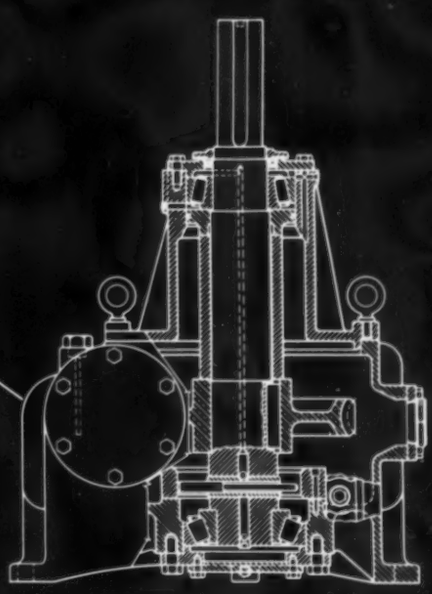
De Laval IMO Motors and Worm Gear Reducers in a Southwest air cooled heat exchanger installation.

De Laval IMO Motors and Pumps



simple, reliable, pulsation-free

De Laval Worm Gear Speed Reducers



ruggedly built for severe service

De Laval Hydraulic Fan Drives for air cooled heat exchangers and cooling towers *save power* since the fan operates at full speed only a portion of the time. Furthermore, there is no demand charge on hydraulic power. • Equally important, they provide *accurate, automatic* control of engine jacket water temperature, and also assure *complete operational flexibility*. Due to the simplicity of De Laval IMO motors and pumps as well as the rugged construction of De Laval Worm Gear Reducers, these units stay on the job for years. Both IMO motor and speed reducer are mounted and factory aligned on a single bedplate.

Investigate *all* the advantages of De Laval Hydraulic Fan Drives. Send for your copy of Bulletin 3009 which includes helpful performance data.

DE LAVAL *Hydraulic Fan Drives*

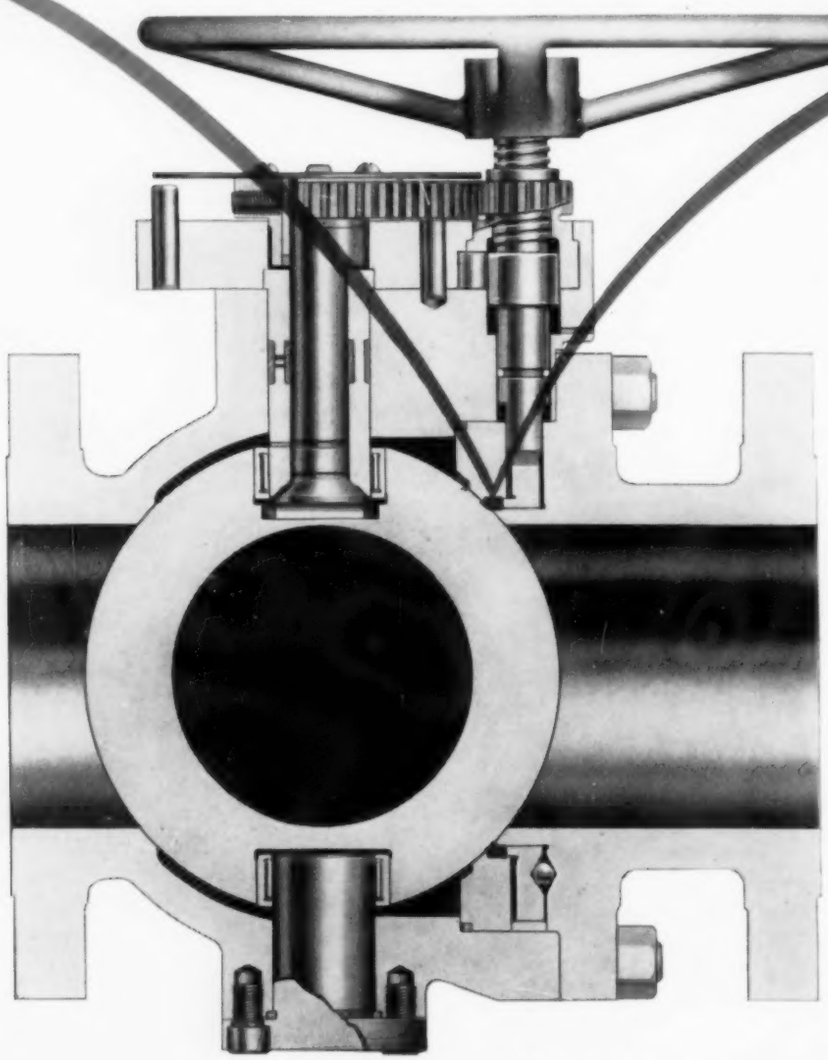
DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

DL370

HYDRIL BALL PLUG Type "K" VALVES

COMPRESSIBLE PORT SEAL
provides
POSITIVE SHUTOFF



Hydril Ball Plug Valves achieve a positive seal against pressure from either direction because the fully enclosed packing ring is *mechanically pressed* tightly against the spherical plug and its seat after the valve is closed.

No other valve has this *controlled* port sealing feature.

SEEP-PROOF, BUBBLE PROOF. The fully confined packing ring is tightly squeezed against plug and seat so that it flows into surface imperfections, around sediment . . . even closes scratches that may occur on the sealing surfaces.

PORT SEAL RETRACTS for easy operation. The mechanical pressure against the port seal is released before plug rotation commences to eliminate seal ring wear and assure easy operation.

•

Write for catalog describing Hydril Ball Plug Valves in full detail.

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